The Builder.

VOL. XXXIII. No. 1703. SATURDAY, OCTOBER 30, 1875.

ILLUSTRATIONS.

New Vestry Hall for the Parish of St. Clement Danes, London.—Messrs. F. Cadogan & J. Butler, Architects 974

The New Choir Stalls, Exeter Cathedral.—Sir Gilbert Scott, R.A., Architect 975

CONTENTS.

"Restauration" and Restoration 963
Sir John Rennie's Autobiography: London Bridge 965
The Late Mr. Edward Roberts, F.S.A. 966
Works Completed or in Progress at Oxford 966
Cranborne Church 967
House Sanitation 967
The Prizes of the Company of Turners 968
Metropolitan Asylum District Competition 968
The Bridge Accommodation across the Thames, and East London 968
The Sanitary Condition of the People 968
Parisian Paper-stainers 969
Winter Exhibition, Dudley Gallery 969
The Worshipful Company of Coachmakers 970
Hydraulics 970
Pictures and their Surroundings 971
Gleanings from the Trade Unions Congress 972
Brickmaking 972
The New Vestry Hall, St. Clement Danes, Strand 974
Competitions 974
The Choir-stalls, Exeter Cathedral 974
Lancing College Chapel: Dedication of the Chapel in the Crypt 977
To What Causes are to be attributed the Want of Sanitary Provisions in the Dwellings of the Upper and Middle Classes, and What is the Best Method which should be adopted to Remedy and Rectify the Same? 977
General Foreman and Clerk of Works 979
New Corn Exchange, Cambridge 980
Glasgow Institute of Architects 980
Workmen's Halls and Colliers' Houses 980
Mahogany in Jamaica 980
Willesden 980
Organs in Churches: St. Mary's Woolnoth, City 980
Filters 981
Concrete Roofs 981
Builder's Charge for Tendering 981
Liverpool Girls' College: an Honourable Secretary 981
School Board Schools 981
Books received: An Old Story, a Temperance Tale in Verse (Virtue) 981
Miscellanea 981

"Restauration" and Restoration.

LATELY there has been rather a movement for popularising with English readers some of the numerous writings of M. Viollet-le-Duc, translations of two of which we have had the pleasure of noticing at some length during the present year. We have now a third small volume,* consisting of a publication in a separate form of a translation of the article "Restauration," from the now well-known *Dictionnaire*. To this the translator has added a reprint, with some additions, of a notice of the French architect's work in connexion with the *Commission des Monuments Historiques* which he contributed to the *Times* of August 24th of last year, and an extract from which we printed, in reference to M. Viollet-le-Duc's daily course of life and habits, presenting a sufficiently remarkable picture of un-hurried and indefatigable industry. In regard to this memoir, as it may in one sense be called, we may be glad that general readers in England should have an opportunity of gaining some knowledge of the character and labours of a remarkably gifted Frenchman; but we should have been better pleased if the style of the writing had been more sober and free from "gush," and may doubt whether the unpretentious and hard-working architect and critic to whom it refers would have altogether chosen to be introduced to the English public in this rather over-eloquent fashion. Moreover, if Mr. Wethered were an architect (he tells us that he is a country doctor), or well up in the *pros* and *cons.* of contemporary architectural doings, he would be aware that by some who are at least as well able to judge as himself the principles and practice of the subject of his notice are not considered to be by any means beyond criticism. We do not say that we are among the critics; and no one who has read our various former articles on M. Viollet-le-Duc and his works will suppose that we are wanting in admiration, not to say enthusiasm, for his genius; still, in personal notices, of contemporary men especially, "*point de zèle*" is a motto worth bearing in mind.

The more important part of the present small volume is the translation of Viollet-le-Duc's own theory and reflections upon the now much-vexed subject of "Restoration"; a subject which in England is in this unfortunate and highly unsatisfactory position, that, now that most of the principal and most valuable architectural monuments of the country have been restored, complaints are made, and in some literary quarters especially very loudly made, that irreparable mischief has been done, and that restoration, as we have come to regard and practise it in England, is a radical mistake, and has involved the wanton destruction of the historic realities of our architecture. While always recommending the employment of the greatest caution and conservatism in the restoration of old buildings, it is needless to remind our readers that we have never adopted this more recent attitude of antagonism to it, though admitting that there are cases in which such operations have been carried to an extent which might rather be termed rebuilding or redesigning than restoring. M. Viollet-le-Duc's essay treats the whole subject in so broad and philosophic a light, affording also as it does an opportunity of comparing the French idea of restoration with the English, that its wider circulation in this form seems a natural opportunity for looking at the subject once more from a partially new point of view.

One thing which the author emphasises at starting is what we think is often practically forgotten even by architects, still more by the public,—how essentially modern and without precedent is the whole idea of architectural restoration. Considering what a matter of course the system has become now, as if it were the most natural and inevitable process possible with an old and decaying building, it is curious to reflect that no nation of any time previous to this century (we may almost say) has thought of employing labour and investigation in this manner. Viollet-le-Duc observes that the Romans, though great builders and rebuilders, had not even a word in their language for the process we know as "restoration": only *instaurare, reficere, renovare*, all signifying to re-instate, to make over again. In Asia, again, both in ancient and modern times, "when a temple or palace has become dilapidated, another has been or is now erected beside it. Its decay is not regarded as a reason for destroying the ancient edifice; that is left to the action of time, which lays hold of it as its rightful possessor, and gradually consumes it." And this distinction between the practice of the present and of all past ages M. Le Duc asks us to regard not as a mere caprice of modern architectural practice, but as a part of the general attitude which the present age has assumed towards all past ages; the awakening of the modern world to the consciousness of the value of the past, and the general research into its history carried out by the students of geology, of comparative anatomy, of philology, &c. This is a very broad view of the subject, and it may be true in part; still, we think it is giving somewhat too great a dignity and importance to the Mediæval restoration movement to place it on anything like the same footing as the great investigations of modern science, which deal with things of such far wider and deeper interest; and it must be remembered also that the same dignity must in that case be conferred on the Classic Renaissance movement, which, in one sense, was just the same kind of movement, and arose out of the same kind of impulses (operating in a different direction) as the Gothic Renaissance; though this, of course, the adherents of the latter will never admit.

To come back, however, to the Latin verbs above quoted: the remark in regard to them seems to indicate an important distinction between the French architect's view of restoration and that held by the leading English members of the profession who have been engaged in it. For the word *renovare*, which Viollet-le-Duc repudiates as not expressing the sense of his "*restauration*," expresses well enough that of the English architect's "restoration." For the avowed object of the latter is the preservation and renewal of that which is falling into decay; and in some instances the re-instating of what was manifestly the original form of the work in place of some incongruous and inferior later addition. But this definition does not cover what is included in Viollet-le-Duc's view of the subject. The greatest and most important work of the kind which he has carried out, the restoration of the Château of Pierrefonds, illustrates this. There was an interesting paper and discussion on the subject of this restoration at a meeting of the Institute of Architects nearly two years ago, on which occasion we had it on the authority of a personal friend of the architect, who took part in the discussion (Mr. Bucknall, the translator into English of several of M. Le Duc's works), that the architect in this restoration had aimed at realising the method which the Mediæval builder of the castle would have adopted, and the result he would have reached, "had he possessed the materials, the appliances, the scientific knowledge, and the facilities for study that the nineteenth century affords, in addition to those that were possessed by the fourteenth." That this is a correct view of the French architect's aims is rendered probable by his own remark in the essay before us, that the modern restorer would be justified in using an iron roof where the Mediæval architect would have used a wooden one. We can imagine the lamentations of archæological societies, and the indignant letters of remonstrance which would be addressed through these columns to the English architect who should venture to hint at such a piece of sacrilege. Such iron roofs were used in the restoration of Pierrefonds; and it is obvious that this restoration, of which we have more detailed accounts than of any other of M. Le Duc's work in this direction, was to the architect's mind an attempt to give life and reality, before modern eyes, to a specimen of a form of architecture belonging to the middle ages, and which particular

* On Restoration. By E. Viollet-le-Duc; and a Notice of his Works in Connexion with the historical Monuments of France, by Charles Wethered. London: Sampson Low & Co.

specimen had, in great measure, to be rebuilt, rather than restored in the English sense. And this view of the restorer's office and object is perhaps at the root of that over-restoration and entire pulling to pieces and rebuilding which appears to be carried to such lengths by French architects, and by which not a few travelling English architects have been moved to great disappointment and indignation. And it is needless to point out that the restorer's professed object in England (however his practice may, under one or another temptation, go beyond it) is to preserve a building as it was originally built, with as little alteration as possible. We have, say, a cathedral, a great part of which has much crumbled and lost its original design, but of which sufficient is left in good repair to show what the design was, and to enable us to restore the decayed parts as they were originally, so as to prolong the life of the building in its original form. This is the spirit of English restoration in its best form, and the principle which is at all events avowed by restorers, whether conscientiously kept to or not, and this is a very different thing from attempting to realise what the Mediæval builder would have done had he lived in the nineteenth century.

The essay "On Restoration" does not, however, ignore restoration as understood by the English architect; and some of the author's remarks on this head are very suggestive in regard to the theory and principle to be followed in what may be termed conservative restoration. In particular, our author goes rather fully into one question which is always presenting itself in the restoration of Mediæval buildings, and about which there is frequent difference of opinion both as to general and particular cases. "It has frequently happened that buildings of a certain period, or of a certain school, have been repaired again and again, and that by artists who do not belong to the province where the edifice is found." (This latter remark, of course, applies specially to French architecture, where provincial distinctions of style are so marked.) "This has been an occasion of considerable embarrassment. If both the original and the altered parts are to be restored, should the latter be disregarded, and the unity of style, which has been disturbed, be re-established; or should the whole, with the later modifications, be reproduced? In such a case the absolute adoption of one of the two alternatives may be objectionable; and it may be necessary, on the contrary, to admit neither of the two principles absolutely, but to proceed according to the special circumstances of the case." He then proceeds to instance some typical cases, of which we may quote one nearly in full, as illustrating the writer's method of looking at the subject:—

"The vaulting of a nave of the twelfth century had by some accident been partially destroyed, and rebuilt at a later period, not in its primitive form, but according to the mode then in vogue. This latter vaulting, threatening in its turn to give way, has to be reconstructed. Shall the primitive vaulting be replaced? *Yes;* because there is no advantage in doing otherwise, and there is a considerable advantage in restoring unity to the edifice. The question here is not that of preserving an improvement made on a defective system, but one in which we have to bear in mind that the later restoration was made according to the ancient method, which consisted in adopting the forms in vogue at the time, when an edifice had to be renewed or restored; whereas we proceed on a contrary principle, that of restoring every building in its own style. But suppose that this vaulting, which is of a character foreign to the first, and which has to be rebuilt, is remarkably beautiful. It has given occasion to the opening of windows adorned with fine painted glass. Shall all this be destroyed for the mere sake of an absolute restoration of the primitive nave? Shall this painted glass be consigned to the lumber-room? Shall exterior buttresses and flying buttresses, which no longer have anything to support, be left purposeless? *No*, certainly. We see, therefore, that in solving problems of this kind, absolute principles may lead to absurdities."

This is very well put as a typical case, and will serve as an illustration of a principle for application in a variety of cases. The reference to the buttresses left "purposeless" by the alteration of the vault reminds us of an error in the contrary direction not unfrequently committed, of restoring features that have nearly disappeared, and for which there is no longer any demand, merely because they were there, or may seem to have been contemplated. We may instance an actual case, in the restoration of a nave, where the springings of external flying buttresses had existed, intended to be built, no doubt, if ever a stone vault had been carried out, which never had been. In the restoration the flying buttresses were built, but the vault was not, and the former were thus purposeless. The discovery by means of one or two doubtful and half-obliterated marks of some peculiar feature which had once existed is a great temptation to restoring architects, who find a field for their ingenuity in building up their conjectures on the apparently enigmatical remains, and then indulge themselves by replacing some feature which had almost utterly disappeared, and which in its day was an excrescence and no integral part whatever of the architectural design. Nothing could well be more indefensible than such a proceeding, which, nevertheless, is often carried out. We have frequently pointed out the principle as correct that what is an essential and integral part of the architectural design should be restored, so long as there are indications, however slight to go upon, on the ground of completing the architectural design; but that an accidental addition, which has no architectural value, however archæologically interesting it may be as a part of the history of the building, loses its interest with its disappearance, and that any reconstruction of it is utterly valueless, the whole interest being in the actual feature itself, and not belonging to any imitation of it.

Another kind of case is mentioned by our author, in which it appears to us by no means easy to decide what is the right and logical course to pursue. The case he supposes is, that between the buttresses of a nave chapels have afterwards been added, in the manner so frequent in French cathedrals. "The walls beneath the windows of these chapels do not in any way tie into the more ancient buttresses, but show clearly enough that these constructions are of later date. It is found necessary to rebuild both the exterior faces of these buttresses, which are decayed by time, and the inclosing walls of the chapels. Should we unite these two constructions of different periods, and which we at the same time carefully restored? *No:* we shall carefully preserve the distinct jointings of the two parts, the un-bondings, so that it may always be apparent that the chapels were afterwards added between the buttresses." The understood object is of course to preserve the history of this part of the building in a manifest manner. But this very effort may lead to a false impression hereafter; for when this restoration also decays by age, the very fact of the straight joint between the wall and the buttresses will lead to the conclusion that this is the original work, and no restoration; and this is only a specimen of the kind of way in which we are inclined to believe that the actual history and date of many buildings in this country will be falsified, and the architectural students of the future entirely taken in as to dates, to an extent that our restoring architects scarcely appear to contemplate at present. How possible such a result is, now that the forms and details of Mediæval Gothic have been so studied and learned off by heart, we may estimate from the fact that the present president of the Institute (certainly about the last person likely to be deceived in such a matter), in the course of some remarks on the occasion of the presentation of the Gold Medal to Mr. Street, observed, as a proof of that gentleman's proficiency in Gothic detail, that he had himself mistaken for old work details which had been made from Mr. Street's drawings during his pupilage. Such an admission is suggestive enough as to the confusion prepared for Gothic students of the future, when exercising their enthusiasm on restored buildings.

The remarks in the essay in regard to some of the practical difficulties and problems in restoration of old buildings (p. 46, *et seq.*), deserve special attention from young architects who are turning their minds towards this important branch of professional work. The author's observations on what may be termed the social and industrial aspects of the restoration movement, are very effectively written. He gives a lively sketch of the opposition to the Mediæval revival, or even to the study of Mediæval art and construction, by the class of people "who would presume to tear out entire chapters of the history of human achievements"; who said, "such and such a vein [of history] is insalubrious, do not disturb it; if you bring it to light we will denounce you to your contemporaries as corrupters!" and who were persuaded that the whole movement meant nothing less than the restoration of *oubliettes*, torture-rooms, tithes, and asceticism. "The amusing part of the matter is, that these fanatics (we keep to the term) lavish on us the epithet *exclusive*, probably because we do not exclude the study of Mediæval art, and even venture to recommend it." As to the effect of the large works of restoration undertaken in France of late years on the industrial trades and branches of workmanship connected with building, Viollet-le-Duc speaks most strongly, and we doubt not with reason; stating that these works have been the means of counteracting to an important extent the bad effects of centralisation, by opening fresh centres of building industry and trade in the provincial towns at or near the scene of operations, and in giving rise to the formation of *ateliers* of art-workmanship to which the greatest opponents of the movement have been glad to come in search of workmen and of methods.

Reverting to the dissatisfaction in regard to restoration now felt and expressed in many quarters, we may repeat what we have before now said, that there are two main heads under which buildings proposed to be restored may be considered. There are buildings which are required for practical use, and those which are of no use any longer, and are only of value as architectural or archæological monuments. In regard to these latter, there seems to be little excuse for restoration at all—sustentation is all that is required. It is next to impossible to renovate an old structure at all without materially impairing, sometimes utterly destroying, its real interest and beauty. Keep it in repair as well as it can be, prop it up, preserve it in every way as long as possible, but on the whole rather let it die with dignity of pure old age than put a new face on it to destroy all that interest of association and of reality which, once tampered with, no power on earth can restore. But the case is different with a building which is being put to practical use. Taking the case of our cathedrals, which seem to be thought more of from a practical point of view at the present moment than they ever have been since the Mediæval period; if one of these is in such a state of decay that it is becoming unsafe, or may be expected to become so, what course can be pursued? We cannot, it is to be feared, adopt what M. Viollet-le-Duc calls specially the Asian practice, and build a new one alongside of it, leaving the old building revered and untouched. Political economists would never sanction such a proceeding. It becomes absolutely necessary, then, to do something; and if a great deal of patching is actually required, it may be better to do the thing thoroughly, and renovate the whole, though we confess it is with grief and pain that we see an old architectural friend putting on a new face in the way some of our cathedrals have done, and we cannot restrain a conviction that in most instances more than enough has been done, and that the enterprise of rival deans and chapters has in some cases led to restoring being carried to an unnecessary and wanton excess. It was not without a thrill of pain that we saw flying statements in papers a few weeks ago that the Dean and Chapter of Durham were on the move in the same direction; and we may be pardoned for indulging a fond hope that among so many restored cathedrals, one, and that one so grand in itself, and so gloriously situated as to have been the admiration and joy of generations of artists, might be spared to us in its old and venerated garb. At the same time, having in view the practical considerations aforesaid, we cannot but think that the strictures habitually passed in some journals upon all architectural restoration are the offspring sometimes rather of over-acted zeal, or of personal feeling, than of due consideration, and we are inclined to think that whatever may be said of our restoring architects, they are far more conservative and cautious, and understand their business better, than those of France. The extent to which restoration is being carried on in that country seems to be something really alarming to all who regard genuine old buildings as furnishing part of the character of a country. We have no quarrel with such a rebuilding, rather than restoration, of the Château of Pierrefonds, as an isolated example of a Mediæval castle in its nearly perfect form; but we should stand aghast at the idea of such a proceeding applied to all the old castles of the country, and we are disposed to think nothing but the question of funds stands in the way of such a campaign. And it is really time for architects and Governments to consider seriously whether what is gained in architectural interest and excitement by the renewing of an old castle compensates for what is lost by taking away the real thing, and whether it would not be a grievous thing to find, in travelling in an historical country, all the old buildings practically gone, and nothing but new, clean, smooth, restored erections. It is committing no small theft on a country to rob it of those old buildings, which have become almost a part of its soil, and

identified with its past history, and give in exchange only cold, hard copies, called "restorations."

SIR JOHN RENNIE'S AUTOBIOGRAPHY.*

LONDON BRIDGE.

Sir John Rennie was rightly described, in a memoir communicated to the Institution of Civil Engineers in the last session, as having "stood alone, the last of a bygone race,—a link connecting the Brindleys, the Smeatons, the Rennies, and the Telfords of the old system, with the Stephensons and the Brunels of the new." His own works, as we shall take occasion to mention, are such as to entitle him to a very high rank in the noble profession which he adorned. The reverence with which, both as a son and as a pupil, he invariably speaks, in the pages before us, of his father, Mr. Rennie, is such as to lead to the wish that the complete life of that great engineer, including a history of his works, and an abstract of his reports, which we believe Sir John Rennie left in a state fit for publication, had appeared at the same time as the Autobiography; to which it would have formed the most appropriate introduction.

Taken, however, by itself, the Autobiography is a work of unusual interest, and of unquestionable merit. Its style is simple and natural: its language has an elegance which breathes of a less feverish, though not less manly, tone of society than that which marks the last quarter of the nineteenth century. His accounts of voyage and travel, of famous places which he has visited, and famous men he has known, have a charm which is even more sensible to those familiar with what he describes, than to those to whom the account has the character of novelty. Above all, the kindly tone of his mind, and the clear penetration of his professional glance, are apparent in every page.

We propose to give some account rather of the works of Sir John Rennie than of a book which we recommend our readers to study for themselves. It will well repay the perusal. We may preface what we have to say by supplying some information not included in the volume. Sir John Rennie was knighted on the occasion of the opening of London Bridge, when the Lord Mayor (Alderman Key) received the more easily-earned dignity of a baronet. He was president of the Institution of Civil Engineers from January, 1845, to January, 1848. He died at Bengeo, near Hertford, on the 3rd of September, 1874, just after completing his eightieth year.

The appearance of the autobiography of the engineer of London Bridge is singularly well-timed. Just when alterations are proposed, it is well that the tale should be retold of the difficulties with which Rennie had to contend in building the present noble structure, and of the legacy of trouble laid by for those who attempt to meddle with it.

The original London Bridge is said to have been built in the year 1176, on the site of an ancient ford. The numerous piers which supported the small arches on which alone the engineering science of the twelfth century, in this country, was bold enough to venture, so contracted the waterway, that the scour of the current dug channels below the level of the foundations. Great starlings, or timber-casings of piles, were, therefore, erected around the piers, in order to keep them from being actually under-cut by the stream. The remedy increased the malady, until the obstructions became so great that there were little more than 8 or 10 clear feet of waterway left beneath the opening of any one of the arches; and at low water the fall at the bridge was as much as 5 ft. perpendicular. Five openings on the south and one on the north, were occupied with water-wheels for pumping water for the City.

The obstruction caused by these works was so great that the celebrated Smeaton was employed by the corporation of London to take down the two arches nearest the centre, and replace them by a single one of 80 ft. span. The bridge itself was covered with houses, leaving only a narrow way between them; forming, in fact, an actual street across the Thames, and erecting a dam, which so resisted both the influx of the tide and the free efflux of the ebb, as to produce a perfect cataract, especially at low water.

Mr. Rennie, the father of Sir John Rennie (who died in 1821), had prepared a design for the new London Bridge. The elevation was subsequently adopted by the son, to whose lot it fell to prepare all the detailed working drawings, specifications, and estimates, as well as to carry out the work. Considerable dispute had arisen between the Corporation of London and the House of Commons; the City then, as now, recommending that the old bridge should be maintained, and improved so as to give more freedom to the traffic. It was the advice of Mr. Rennie, on the contrary, that a temporary wooden bridge should be erected above the line of the old structure; that the latter should then be entirely removed; and that when the river had been restored to something like its natural condition, by the demolition of this great obstacle to its current, an entirely new bridge should be erected on the line of the ancient crossing.

The opposition of the Corporation to the removal of the old bridge, before the construction of the new one, was, however, so pertinacious, that an unfortunate compromise between the plan of the City and that of Mr. Rennie was ultimately effected. The engineering difficulties attending the construction of the new bridge were greatly aggravated by this pertinacity on the part of the Corporation, and the line of the approaches was permanently disarranged. Not only had all the works for the formation of the new foundations to be carried on in the teeth of the violent currents caused by the old starlings, but the depth of water in which the foundations were laid was 5 ft. more than would have been the case if Rennie's counsel had been followed, being as much as 28 ft. at low water spring tides. The old bridge, Sir John Rennie remarks, stood on a sort of hill below the water, the foundations of the piers being from 28 ft. to 30 ft. above the bottom of the river immediately above and below it. These holes had been dug by the great fall and scour produced by the contraction of the waterway. It was in one of these holes, and exposed to the scour of the flood, that the present bridge was built.

It was not until 1828 that the plan ultimately adopted for the approaches to the bridge was decided; and that notices were given for a Bill to empower the Corporation to carry them out. It is probable, however, that the necessary deviation from the original line of Old Fish-street-hill facilitated that feature of the Viaduct to which it chiefly owes the admirable character of its adaptation to the exigencies of the traffic. The original design was to make the approaches at the ordinary highway ascent of one in thirty. The great traffic of Upper and Lower Thames-street, crossing that of the bridge, must thus have created a block which would, long before the present time, have become perfectly intolerable. Sir John Rennie remarks that if it had been proposed to divert the traffic from the old line of Fish-street-hill in the first instance, it is most probable that it would never have been carried. But when the question pressed for solution, it was again referred to the engineer, who very gladly took the opportunity of recommending an arch over Thames-street. We can judge from a comparison with the approaches to Southwark Bridge how much the City owes to this addition to the original design, which at once disentangled the heavy river-side traffic from the lighter coach and passenger traffic served by the bridge, and abolished the old hill by the present convenient level approach to the structure. The cost of the approaches was estimated at 1,400,000*l.* Neither the actual cost, nor that of the bridge itself, is mentioned by Sir John Rennie. The extra cost of making the roadway 54 ft., instead of 48 ft., as at first designed, was 46,000*l.*; but this is, of course, only an addition on paper,—a totally different thing from an addition to a completed structure. The foundations of the old bridge were removed by the contractors, Messrs. Joliffe & Banks, for the sum of 10,000*l.*; they having the benefit of the old materials, except that they had to fill up the holes in the bed of the river, above described, to the level of 14 ft. below spring tide low-water mark.

At a moment when it is in contemplation either to throw an additional weight of considerable amount on the foundations prepared by Sir John Rennie for his 54-ft. roadway, or to widen the piers which he erected under such stress of difficulty, caused by a current which now no longer exists, it is highly instructive to be made aware of the careful measures adopted by that able engineer, and of the very threatening circumstances which menaced the stability of a structure, of which the obstinacy of the Corporation of the City of London had compelled the erection under the most disadvantageous conditions that were possible at the time.

Mr. Rennie's design consisted of five semi-elliptical arches, the centre being 150 ft. span, the two next arches 140 ft. span each, and the two side, or land arches, 130 ft. span each. The two centre piers were each 24 ft. wide at the springing, the two side piers 22 ft. each, the whole to be built of the best grey granite. To lay the foundations of these piers it was quite necessary to remove, by dredging, the stone which had been washed from around the piers of the old bridge, and which so filled the holes in the river as to render pile-driving impossible. The cofferdams for the new piers were elliptical in form, in order to resist the strong current in which they were placed. They consisted of two main rows of piles, each 14 in. square, each pile being properly hooped and shod with wrought iron, and driven 25 ft. into the bed of the river. These piles were connected together by three rows of braces, 15 in. square, at the level of low water, half-tide, and high water. At every 10 ft. the two rows of piles were fastened together by 2¼-in. bolts, passing through the 15-in. walings, and secured inside and outside with wooden cleets, 15 in. square and 8 ft. long, so as to cover the joints of the horizontal braces. Six feet without the two main rows of piles was a third row of the same dimensions, braced and bolted as before mentioned to the two inner rows. When these three rows had been driven, the joints between the piles were caulked with oakum, and paid over with hot pitch, so as to render them water-tight. The spaces between the three rows of piles were then filled with strong well-puddled clay.

In the space thus inclosed a fourth series of piles was driven in the form of a parallelogram, corresponding with the exact size of the foundations of the piers. This row of piles was again braced to the external cofferdam, so as to bind the whole structure together like a well-made cask. The water was pumped out by a powerful steam-engine, and the earth within the cofferdam was thus excavated to the low-water spring-tide level. Into the interior parallelogram, piles of Baltic fir, elm, and beech, 12 in. square, and 3 ft. 6 in. from centre to centre, were then driven, penetrating 20 ft. into the solid clay. The heads were cut off level, and Baltic fir sills, 14 in. square, were bolted to each pile-head by jagged wrought-iron spikes. The spaces were filled with concrete, stonework, and brickwork. This was planked over with 6-in. elm plank, bedded in mortar, on which the footing course of the actual pier was laid. The masonry diminished by 12-in. offsets till it reached the shaft of the pier, which was carried up solid to the springing of the arches.

We have given this brief abstract of the detailed account furnished by Sir John Rennie, not only to show the thorough system on which the foundations of London Bridge were laid, but further to point out the difficulties and dangers that must attend any attempt to add to this well-balanced structure. The whole of each cofferdam was prepared for the simple purpose of allowing the proper formation of the pier foundation within it. The basis of each pier, resting on the parallelogram of piles driven 20 ft. into the clay, may be considered as equivalent, in the opinion of the engineer, to a solid pier of the net dimensions, resting on the undisturbed London clay, at a depth of 20 ft. below low-water mark. But we have seen that the foundations of the piers of the old bridge, which must have been at least as low as low-water mark, were from 28 ft. to 30 ft. above the bottom of the holes dug in the channel by the force of the current above and below the old bridge. The bottoms of these holes, therefore, were from 8 ft. to 10 ft. below the level at which the weight of the new bridge came upon the London clay. It is true that these holes were subsequently filled up to the level of 14 feet below low water, or 6 ft. above the lowest point of the new foundations. But filling up with stone and rubbish would not restore the original solidity of the clay bed of the river.

This fact must be borne steadily in view, for the reason that we have experience as to the behaviour of the London clay, however apparently solid, under heavy pressure, which has been acquired long since the erection of London Bridge. Even at a depth of 80 ft. or 100 ft. the formation in question partakes of the nature of a semi-fluid. Under a sufficient degree of pressure it yields, and finds the nearest way of

* "Autobiography of Sir John Rennie, Past President of the Institution of Civil Engineers: comprising the History of his Professional Life, together with Reminiscences dating from the Commencement of the Century to the Present Time." London: Spon. 1875.

escape. This fact came to light in the construction of the tunnel for the London and North-Western Railway through Primrose-hill. The designs of Mr. Robert Stephenson for the general tunnel section to be used on the London and Birmingham line gave a partially elliptical section, with an invert forming an arc of a circle. The first tunnel commenced was through the solid chalk, with flints, in the neighbourhood of Watford. The late Sir Charles Fox, then sub-assistant on this division, proposed the substitution of footings to the side wall for the invert shown on the contract drawings in this tunnel. Mr. Stephenson gave his assent, and the gain in economy, and still more in the facility with which the work could be pushed on, were so great that a similar change of section was ordered for the Primrose-hill tunnel. After some little time, however, it became evident that what miners term "creep" was going on. The solid clay, under the pressure of the undisturbed mass above it, began to rise, and, if no remedial measures had been taken, would soon have filled the tunnel to the roof. The original section was therefore reverted to in this place, and the invert inserted, which effectually preserved the tunnel.

This piece of definite engineering experience has the most important bearing on any plan for adding to the width of London Bridge. We have seen the care with which Sir John Rennie provided for the foundations of his piers. That these foundations might be able to sustain a somewhat greater weight is possible; although, as we shall show, it is not certain. But no addition to the width of the bridge is worth considering that does not add accommodation for two additional lines of carriage-traffic to the four now carried by the structure,—that is to say, it is proposed to make Rennie's foundations do, say, 40 per cent. more duty than they were designed to perform. It may be said that by the substitution of iron for stone the additional weight imposed on the foundations will not be proportionate to the additional width given to the structure. But it must be remembered that it is not only dead, but living, weight that will be added by an increase of carriage-way. The vibration is very likely to increase in a greater ratio than the actual weight. Thus the stress thrown on the foundations cannot safely be taken as less than we have indicated.

The account above given of the mode of erecting the bridge, and of the nature of the channel of the Thames at its site, puts out of the question any idea of enlarging the foundations of the piers. To do this, new cofferdams must be driven, and the contraction of the waterway thus occasioned would soon dig below the bottom of the piles on which the structure rests. The alternative would be to carry up additional masonry from the footings of the present piers. How much width could be thus obtained is not evident from the account we have cited; but whether this plan, which would be architecturally the only admissible one, or that of cantilevers, or that of skew-backs, were adopted, we still come to the doubtful expedient of throwing 40 per cent. additional stress on Sir John Rennie's foundations. Will they bear so much more than they were designed to support?

Let us consult the experience of the engineer of the bridge:—"After the fifth arch, the first on the Surrey* side, was keyed," says Sir John Rennie, "the sinking was observed to be 4 in., or about 1 in. more than the others. . . . I also observed that two of the quoins on the south-east end of the fourth arch from the Surrey shore had splintered off at the soffit. . . . Upon levelling the piers, it was found that the east end had subsided from 10 in. to 14 in. more than the upper or west end. This I could account for in no other way but that there had been a greater scour here than at the upper end, and that the piles had to some extent been laid bare."

The experience above detailed as to the behaviour of the London clay supplies a link that is wanting in the explanation of this subsidence. The scour of the ebb tide was more powerful than that of the flow; the holes dug below the bridge must thus have been deeper than those above. When the full weight came on the London abutment, it is clear that the clay beneath the foundation yielded. To the depth of from 10 in. to 14 in. it must have been squeezed out towards the least resisting line; that is to say, towards the sea. With this degree of movement the abutment came to its bearing. No subsequent movement was detected by Sir John Rennie, who constantly levelled the arches and piers, for several months after that subsidence, from a fixed standard gauge. But what would have been the result had 40 per cent., or even 15 per cent., more stress been thrown on a foundation which had begun to creep? What will be the result if it is now attempted? We do not imagine that any engineer of position will take the responsibility of the experiment.

We have been induced thus far to dwell on the light which is thrown, by the pen of Sir John Rennie himself, on the delicate equilibrium of the foundations of London Bridge, from the sense of the great danger to which the City authorities, as at present resolved, are about to subject that great national monument. Mr. Colleton Rennie, the editor of the present volume, has published a letter on the subject, in which he very clearly points out the inadequacy of any attempt to facilitate the City and borough traffic by the widening of London Bridge. As to that, there is no room for difference of opinion; that is to say, of educated and intelligent opinion. But Mr. Rennie, with a family pride which is not only pardonable but becoming, dwells on the improbability that any public works constructed by his family should not be able to bear a little judicious alteration. We think, however, that the record, written by Sir John Rennie, is enough to prove that the word judicious cannot apply to any attempt to tamper with a structure satisfactorily erected under such stress of difficulties, which so nearly overcame the equilibrium of the bridge.

Sir John Rennie's first professional occupation was to make the working drawings of his father's designs for Southwark Bridge, in 1814–15. He was then between twenty and twenty-one years of age, his education, in languages, in mathematics, and in the mechanical duties of his profession, having been pursued, up to that time, with a care not very usual amongst the engineers of this country, but which afterwards bore ample fruit. He leaped into the saddle at a bound, for his first independent advice seems to have been that the abutment springers for the iron arches of this bridge should consist of solid blocks of granite, of a size not theretofore introduced in England. To carry out this wise suggestion he paid a visit to Aberdeen. He found the granite quarries in that vicinity to be open only on a small scale for obtaining pitching stones. The proprietors would not bestir themselves to produce larger blocks. Young Rennie explored the country, and found promise of solid and accessible stone at Peterhead, thirty miles from Aberdeen. He describes, in very instructive detail, the procedure by which he quarried, transported, and finally shipped a block of this now well-known red granite, of the unprecedented weight of twenty-five tons. A peep at the hearty hospitality of Mr. Fergusson, of Pitfour, reminds the reader that "'tis sixty years since."

We hope to conclude this notice of a very agreeable book in our next number.

* We cite textually, but think Middlesex side is meant.

THE LATE MR. EDWARD ROBERTS, F.S.A.

Mr. Edward Roberts, whose death at the comparatively early age of fifty-six we have already mentioned, has not lately designed many buildings, his practice having mainly consisted of heavy compensation cases in connexion with metropolitan improvements and railway works, in which branch he showed his ability to grasp the general merits of a case as well as the more minute details. Some of his papers which we have seen prove the singular care with which he dealt with his valuations. This attention to the minutiæ of his business contributed to his reputation, and also secured for him the name which he acquired amongst his professional brethren of "Maximum Roberts," on account of the sums which he usually succeeded in obtaining for his clients.

His earliest architectural work of which we know anything is the Institution and Market at New Swindon, a view and plan of which will be found in our volume for 1854.* He was architect of Christ's College, Finchley, where he also built a lodge for Mr. Heal. Mr. Roberts was an enthusiastic Freemason, member of the Grand Lodge for many years, also of the Middlesex and Methuen Lodges, and secretary of the former for thirty years. The Methuen Lodge was consecrated at Swindon, we remember, when Lord Methuen laid the first stone of the Institution already referred to.

Mr. Roberts was a Fellow of the Royal Institute of Architects (elected 1860), and a Fellow of the Society of Antiquaries. He was intimately concerned, in connexion with Mr. G. R. Wright, in the foundation of the Junior Athenæum Club, and converting for its purposes a house in King-street, St. James's. When the club removed to Hope House, in Piccadilly, he designed, amongst other works there, the very handsome and commodious Smoking-room which the club possesses.

The subject of our notice had been elected an Associate of the British Archæological Association in 1856, and became one of the Hon. Secretaries in 1862. From that time he attended the Congresses very regularly, and contributed greatly to their success by his lucid description of ancient buildings visited on those occasions, the salient points of which he laid hold of with much facility, and pointed out with equal felicity. The Journal of the Association contains many papers contributed by him, some illustrated by his measured drawings. He took part in the last Congress, that of Evesham, though it was obvious to his friends that his health was in a serious condition. Soon after that event the news reached him of the premature death of his son in a distant country, and the shock appears to have expedited his death. His remains were buried at Kensal-green Cemetery, on Wednesday, the 20th inst., when besides the members of his family, there came a number of his professional brethren, including Mr. T. Blashill, Mr. Loftus Brock, Mr. Warburton Stent, and others, to pay their last affectionate respects to a departed friend.

Mr. Roberts leaves a widow and three daughters to mourn a very great loss.

* Vol. xii., pp. 346, 347. See also "A Visit to Swindon New Town," p. 289, in the same volume.

WORKS COMPLETED OR IN PROGRESS AT OXFORD.

According to its usual custom at the commencement of Michaelmas Term, the *Oxford Journal* gives a detailed account of the buildin operations of Oxford during the past twelve months. We cull a few particulars of the more important items of the account, which occupies nearly a page of the *Journal*.

At *Christ Church College* a great deal of work is being done by Messrs. Symm & Co., builders, of Oxford, in the way of alteration if not in the way of improvement. In "Tom Quad" all the decayed stonework is being taken away and replaced with new material, and in place of the parapet erected by Sir Christopher Wren, a new one, consisting of battlements in accordance, it is said, with the original idea, is being erected. Shields bearing the armorial bearings of Henry VIII. and Cardinal Wolsey, the founders, and the benefactors of the college, are being placed at intervals, and it is intended to carry out the alteration entirely round the Quad. Over Kilcanon arch, in the north-east corner, a low tower is being erected with a stair turret, for the purpose of giving greater accommodation. Wall-ribs are being inserted upon the original lines shown round the Quad, and upon the old foundations which were discovered some time since the bases of buttresses are being constructed, the intention being at some future time, it is stated, to erect cloisters. The drive round the Quad has been altered to the original lines, as laid down in an old print bearing date 1673, which will have the effect of making it look much larger, besides providing a more direct approach to the various entrance doorways. A new parapet is also being placed upon the hall, with a pinnacle running up from each buttress to show the different bays, and each alternate panel will contain an elaborately-carved design of the arms of Henry VIII. and Cardinal Wolsey. The whole of the work is being erected in Taynton stone, but has been delayed by the strike among the masons in the summer. The architects are Messrs. Bodley & Garner, London, and the clerk of the works is Mr. Fitzwilliam.

In the *Cathedral* two stained-glass windows have been put in—one by Messrs. Clayton & Bell, and the other by Messrs. Morris & Co. A memorial window is shortly to be placed in the north transept, facing the pulpit, by Messrs. Clayton & Bell. The old heating apparatus at the back of the cathedral has been pulled down, and enables a better view to be obtained of that side from the Broad Walk. The doorway into the Dean's house has been removed into the next bay to where it originally stood.

The "Tea Chest" in which the cathedral bells were placed a few years since, over the staircase leading to the hall, still remains, but plans have been prepared for the erection of a tower, a

work which will be ere long commenced. Last year the governing body of Christ Church invited and received plans from six architects, Sir G. G. Scott, Mr. T. N. Deane, Mr. Bodley, Mr. Hugall, Mr. T. G. Jackson, and Mr. Champneys, for inclosing the bells within a more suitable structure. A design for this proposed bell-tower, by Mr. James Fergusson, was illustrated in last week's *Builder*.

At *New College* the first portion of the extensive additions in Holywell-street was completed and occupied at the commencement of this year, the additional accommodation provided being two sets of rooms for fellows, and thirty-eight for undergraduates, besides two large lecture-rooms. A further extension of the building is now in progress, and it is expected to be completed some time next year. The length of the building already completed is 273 ft.; depth, 33 ft.; and the height from footing to ridge, 75 ft. This extension will give twenty-one sets of rooms for undergraduates, with a fellow's house at the west end. The fronts are entirely of Milton stone, and the carved work is being executed by Messrs. Farmer & Brindley. For the purpose of access from the old to the new buildings, a stone groined passage has been designed by the architect, Sir Gilbert Scott, and is now nearly completed, this part of the work being executed in Ancaster stone. Messrs. Jackson & Shaw, of London, are the contractors, and Mr. H. Roome is the clerk of the works.

The enlargement of *Balliol College* has been continued this year by the addition of nine sets of rooms for undergraduates at the west and four for fellows at the east end of the hall. A new hall is in course of erection, the floor of which will be laid with Dennett's patent fire-proof flooring. The hall is 90 ft. by 36 ft. in the clear, and the internal facings will consist of Bath stone. The staircases are of York stone, and the windows of the hall will be ornate in character. The total cost of the enlargements will be 25,000*l*. The architect is Mr. Waterhouse; the builder is Mr. Horsman, of Wolverhampton; and the clerk of the works is Mr. Simmonds.

At *Merton College* extensive works have been carried out during the Long Vacation by Messrs. Fisher & Hobdell, builders. The fine old tower has undergone restoration, the old stonework having been removed over about three-fourths of its surface to the depth of from 7 in. to 1 ft. and replaced with new Milton stone. The tracery of the windows is entirely new, and oak louvres have been substituted for the old Stonesfield slates. The parapet also has been restored, and in consequence of one of the pinnacles having been partially destroyed by lightning a few weeks ago, it has been determined to fix one of Newall's patent conductors to each pinnacle.

The last new block of buildings at *Keble College*, containing accommodation for thirty-seven undergraduates and three tutors, will be ready for occupation this term. This block is built in the same style as the other parts of the college, but differs from it in being an extra story higher. The residence for the warden will be at once begun at the south-east corner of the college site. It is intended, if possible, to open the chapel on St. Mark's Day (April 25) next year, and it is also proposed at the same time to lay the first stone of a new dining-hall and library, which have been lately offered to the college by an anonymous benefactor. These will occupy the site of the present temporary chapel and dining-hall on the south side of the large quadrangle, and will divide the two quadrangles of which the college will hereafter consist. Mr. W. Butterfield is the architect for the whole of the works; and the builders are Messrs. Parnell & Sons, of Rugby, Mr. Bond being the clerk of the works.

At *Brasenose College* a new Bath stone parapet has been erected upon the Hall, and a new oak roof has been placed round the front quadrangle. Messrs. Wyatt & Son were the contractors.

A considerable amount of work has been executed at *Wadham College* by Messrs. Wyatt & Son. The old chimney shafts in the front have been removed, and new ones built in Bath stone. Some old outbuildings have been removed for the purpose of enlarging the back quadrangle.

At *All Souls' Chapel* the restoration of the reredos is still in progress, and Mr. E. E. Geflowski, the sculptor, has completed the central piece, which consists of a Crucifixion group in high relief.

A new lecture-room, 31 ft. by 16 ft., has been erected at *St. John's College*, and other works have been carried out by Messrs. Wyatt & Son.

The south end of the Library of *Jesus College*, facing Market-street, is being restored in Bath stone by Messrs. Wyatt & Son.

At *St. Mary's Church* important works of restoration will, it is authoritatively stated, shortly be commenced from designs by Sir Gilbert Scott; the total cost will be about 18,000*l*.

St. Mary Magdalen Church has undergone considerable repair and restoration, under the superintendence of Mr. Wilkinson, architect. The old stone slating has been removed and replaced with Westmoreland slates, the tower has been re-roofed and repaired, and the bells have been re-cast and re-hung by Mr. White, of Besselsleigh. In the interior, the gallery at the west end has been removed, together with all the old pews, and the old vestry walls under the tower have been taken away, and a new vestry provided in the south aisle. Messrs. Wyatt & Son were the contractors, and the total outlay was about 2,000*l*.

The ancient tower of *St. Michael's Church* having been found, upon examination by Mr. Bruton, architect, to be in an unsafe condition, a plan was designed by that gentleman of tying together the structure by a cradle of oak timbers within the walls. Three ancient windows were opened during the progress of the work. Mr. Selby, of Oxford, builder, has carried out the work.

The enlargement of *Summertown Church*, to the extent of about 150 seats, has been carried out by Messrs. Franklin & Sons, of Deddington, from plans by Mr. G. E. Street, R.A. The west and north walls of the nave have been taken down, and the nave has been extended westward about 20 ft., and a new aisle built on the north. A new organ-chamber and vestry are built on the north of the chancel, and provision has been made for the reception of Haden's heating apparatus. The total cost will be about 1,600*l*. Plans are in preparation for a new porch.

The Roman Catholic *Church of St. Aloysius* has made considerable progress. The architects are Messrs. J. A. Hansom & Son, Brompton, and Mr. Claridge, of Banbury, is the contractor. The style is Early Transitional Gothic, and the materials used are white brick, with Bath stone dressings. Mr. Firth is the clerk of the works.

The new *Chapel of King Edward's School*, Summertown, is being proceeded with, from designs furnished by Mr. Wilkinson, the architect of the school. The style is Early English, the materials used being Gibraltar stone for the walling and Box-ground stone for the dressings. Messrs. Symm & Co. are the builders.

The *Barracks* at Bullingdon, in connexion with the Oxford Military Centre, are progressing rapidly in the hands of the contractors, Messrs. Downs & Co., of London. The entire buildings will cost 50,000*l*., and, it is expected, will be fit for occupation by January next.

A large number of minor works have been completed or are in progress. These include additions to and enlargement of chapels, schools, and public institutions of various kinds, and the erection of many new houses and shops. In all the more important works we have noticed great attention is stated to have been paid to drainage and water-supply and to sanitary arrangements generally.

CRANBORNE CHURCH.

The new chancel of the parish church at Cranborne, in the county of Dorset, dedicated to St. Mary and St. Bartholomew, was opened on the 9th inst., by the Bishop of Salisbury. The early records of this very ancient church are to be found in the chronicles of Tewkesbury Abbey, from which it appears that in the year 930, during the reign of King Athelstane, a small monastery was founded there, which was afterwards incorporated with the Manor of Gloucester, and conferred by William Rufus upon Robert Fitzhamer, in the early part of the twelfth century, by whom the church at Tewkesbury was built, and who made Cranborne a priory. The church occupies an elevated position near the interesting manor-house of Cranborne, one of the residences of the Marquis of Salisbury (illustrated by Mr. Nash in his "Mansions of the Olden Times"), which, together with the manor, was granted to the first Earl of Salisbury by James I., and from which the eldest son of the Marquis derives the title of Viscount Cranborne.

The present church consists of a western tower, nave and aisles, a chancel and vestry, which probably was in former times used as a side-chapel. The entrance-porch, on the north side of the nave, has a parvise over it. The church, with the exception of the chancel, which has now been rebuilt, is of an early period of architecture, being of the beginning of the thirteenth century; but the fine Norman doorway in the tower remains to show the existence of a still earlier building upon the same site. The chancel was of very much later date,—the fifteenth century,—and there is also some late work in the tower, though of a somewhat earlier period.

The chancel having become quite dilapidated, has been taken down and rebuilt upon the old foundations. The vestry has been enlarged, and an organ-chamber added on the north side to receive the organ, which was formerly placed in the tower, and greatly obstructed the view of the west window. The new walls are built with brickwork faced with flints, and the new chancel arch, the windows, doorways, and other details of the new work are of the Early English period of architecture, the same as the nave and aisles, and are executed in Tisbury and Bath stone, with Devonshire marble shafts on the inside. A new open-timbered roof has been substituted for the former low plastered ceiling, and new oak seats have been provided instead of the old benches. The floor of the chancel, which was lower than that of the nave, and extremely damp at most times, has been raised and paved with encaustic tiles. The surface of the surrounding ground has been taken off for some distance from the church, and the area of the burial-ground largely increased by the removal of the south wall of the churchyard to a further distance, which enables the fine proportions of the edifice to be seen to much greater advantage.

The works have been carried out at the expense of the Marquis of Salisbury, under the direction of the architect, Mr. David Brandon. The contractors were Mr. Kilford, of Cranborne, and Messrs. Bleathman & Son, of Wimborne; Mr. W. H. Chapman having acted as clerk of works.

The entire area of the church is now warmed by a combined system of warm air and hot water, the apparatus having been supplied by Messrs. Haden & Sons, of Trowbridge.

HOUSE SANITATION.

Amongst the remarks made by Mr. Eassie, C.E., in the paper which he read at the late Social Science Congress at Brighton, he pointed out some of the many mischievous mistakes which are made in the choice of sites. He said,—Where, unfortunately, a house too good to abandon has been built upon marshy land, the land should be systematically drained, and the surroundings of the house planted with vegetation which has been found to rapidly absorb moisture. The Eucalyptus and Helianthus have been found especially useful in this way. All plants and flowers possessing green leaves and aromatic odours are also proved to yield ozone when exposed to the sun's rays, and this agent is malaria's deadliest foe. There is also the rising wet and the drifting wet to keep out of the walls of the house, and this is only to be achieved by using damp-proof courses a little above the ground line, and by adopting hollow walls. Impervious walls are a mistake; for the constant vapour given off in the house will condense inside and soak into the walls, and not allow it to be passed through the pores to the outside. In like manner the new washable wall linings and water-proof paper-hangings are objectionable for the inside of exterior walls. The last kind of dampness which he would notice was that which resulted from the absence of proper area walls, and by the banking up of damp earth against the basement walls. No cure exists for this state of things in the way of damp-proof washings, nothing but the interposition of an area space. When a stone cellar-floor has been laid upon the bare ground, or what is just as common to discover, a wooden ground-floor, the resulting chilliness is unbearable, and when "motley" like this has been the wear, the only cure is concrete. Houses, too, are far too frequently partially built of old materials, and for the most part these old and sodden bricks and brick-bats are used up in the interior partition walls; nor is that all, for the old plaster is commonly worked up with the new to facilitate setting. This is fruitful source of evil, and has been alluded to as accounting for a good portion of our metropolitan mortality. In the author's opinion, these old bricks should never be used until they have been set up again kiln fashion

escape. This fact came to light in the construction of the tunnel for the London and North-Western Railway through Primrose-hill. The designs of Mr. Robert Stephenson for the general tunnel section to be used on the London and Birmingham line gave a partially elliptical section, with an invert forming an arc of a circle. The first tunnel commenced was through the solid chalk, with flints, in the neighbourhood of Watford. The late Sir Charles Fox, then sub-assistant on this division, proposed the substitution of footings to the side wall for the invert shown on the contract drawings in this tunnel. Mr. Stephenson gave his assent, and the gain in economy, and still more in the facility with which the work could be pushed on, were so great that a similar change of section was ordered for the Primrose-hill tunnel. After some little time, however, it became evident that what miners term "creep" was going on. The solid clay, under the pressure of the undisturbed mass above it, began to rise, and, if no remedial measures had been taken, would soon have filled the tunnel to the roof. The original section was therefore reverted to in this place, and the invert inserted, which effectually preserved the tunnel.

This piece of definite engineering experience has the most important bearing on any plan for adding to the width of London Bridge. We have seen the care with which Sir John Rennie provided for the foundations of his piers. That these foundations might be able to sustain a somewhat greater weight is possible; although, as we shall show, it is not certain. But no addition to the width of the bridge is worth considering that does not add accommodation for two additional lines of carriage-traffic to the four now carried by the structure,—that is to say, it is proposed to make Rennie's foundations do, say, 40 per cent. more duty than they were designed to perform. It may be said that by the substitution of iron for stone the additional weight imposed on the foundations will not be proportionate to the additional width given to the structure. But it must be remembered that it is not only dead, but living, weight that will be added by an increase of carriage-way. The vibration is very likely to increase in a greater ratio than the actual weight. Thus the stress thrown on the foundations cannot safely be taken as less than we have indicated.

The account above given of the mode of erecting the bridge, and of the nature of the channel of the Thames at its site, puts out of the question any idea of enlarging the foundations of the piers. To do this, new cofferdams must be driven, and the contraction of the waterway thus occasioned would soon dig below the bottom of the piles on which the structure rests. The alternative would be to carry up additional masonry from the footings of the present piers. How much width could be thus obtained is not evident from the account we have cited; but whether this plan, which would be architecturally the only admissible one, or that of cantilevers, or that of skew-backs, were adopted, we still come to the doubtful expedient of throwing 40 per cent. additional stress on Sir John Rennie's foundations. Will they bear so much more than they were designed to support?

Let us consult the experience of the engineer of the bridge:—"After the fifth arch, the first on the Surrey* side, was keyed," says Sir John Rennie, "the sinking was observed to be 4 in., or about 1 in. more than the others. . . . I also observed that two of the quoins on the south-east end of the fourth arch from the Surrey shore had splintered off at the soffit. . . . Upon levelling the piers, it was found that the east end had subsided from 10 in. to 14 in. more than the upper or west end. This I could account for in no other way but that there had been a greater scour here than at the upper end, and that the piles had to some extent been laid bare."

The experience above detailed as to the behaviour of the London clay supplies a link that is wanting in the explanation of this subsidence. The scour of the ebb tide was more powerful than that of the flow; the holes dug below the bridge must thus have been deeper than those above. When the full weight came on the London abutment, it is clear that the clay beneath the foundation yielded. To the depth of from 10 in. to 14 in. it must have been squeezed out towards the least resisting line; that is to say, towards the sea. With this degree of movement the abutment came to its bearing. No subsequent movement was detected by Sir John Rennie, who constantly levelled the arches and piers, for several months after that subsidence, from a fixed standard gauge. But what would have been the result had 40 per cent., or even 15 per cent., more stress been thrown on a foundation which had begun to creep? What will be the result if it is now attempted? We do not imagine that any engineer of position will take the responsibility of the experiment.

We have been induced thus far to dwell on the light which is thrown, by the pen of Sir John Rennie himself, on the delicate equilibrium of the foundations of London Bridge, from the sense of the great danger to which the City authorities, as at present resolved, are about to subject that great national monument. Mr. Colleton Rennie, the editor of the present volume, has published a letter on the subject, in which he very clearly points out the inadequacy of any attempt to facilitate the City and borough traffic by the widening of London Bridge. As to that, there is no room for difference of opinion; that is to say, of educated and intelligent opinion. But Mr. Rennie, with a family pride which is not only pardonable but becoming, dwells on the improbability that any public works constructed by his family should not be able to bear a little judicious alteration. We think, however, that the record, written by Sir John Rennie, is enough to prove that the word judicious cannot apply to any attempt to tamper with a structure satisfactorily erected under such stress of difficulties, which so nearly overcame the equilibrium of the bridge.

Sir John Rennie's first professional occupation was to make the working drawings of his father's designs for Southwark Bridge, in 1814–15. He was then between twenty and twenty-one years of age, his education, in languages, in mathematics, and in the mechanical duties of his profession, having been pursued, up to that time, with a care not very usual amongst the engineers of this country, but which afterwards bore ample fruit. He leaped into the saddle at a bound, for his first independent advice seems to have been that the abutment springers for the iron arches of this bridge should consist of solid blocks of granite, of a size not theretofore introduced in England. To carry out this wise suggestion he paid a visit to Aberdeen. He found the granite quarries in that vicinity to be open only on a small scale for obtaining pitching stones. The proprietors would not bestir themselves to produce larger blocks. Young Rennie explored the country, and found promise of solid and accessible stone at Peterhead, thirty miles from Aberdeen. He describes, in very instructive detail, the procedure by which he quarried, transported, and finally shipped a block of this now well-known red granite, of the unprecedented weight of twenty-five tons. A peep at the hearty hospitality of Mr. Fergusson, of Pitfour, reminds the reader that "'tis sixty years since."

We hope to conclude this notice of a very agreeable book in our next number.

* We cite textually, but think Middlesex side is meant.

THE LATE MR. EDWARD ROBERTS, F.S.A.

Mr. Edward Roberts, whose death at the comparatively early age of fifty-six we have already mentioned, has not lately designed many buildings, his practice having mainly consisted of heavy compensation cases in connexion with metropolitan improvements and railway works, in which branch he showed his ability to grasp the general merits of a case as well as the more minute details. Some of his papers which we have seen prove the singular care with which he dealt with his valuations. This attention to the minutiæ of his business contributed to his reputation, and also secured for him the name which he acquired amongst his professional brethren of "Maximum Roberts," on account of the sums which he usually succeeded in obtaining for his clients.

His earliest architectural work of which we know anything is the Institution and Market at New Swindon, a view and plan of which will be found in our volume for 1854.* He was architect of Christ's College, Finchley, where he also built a lodge for Mr. Heal. Mr. Roberts was an enthusiastic Freemason, member of the Grand Lodge for many years, also of the Middlesex and Methuen Lodges, and secretary of the former for thirty years. The Methuen Lodge was consecrated at Swindon, we remember, when Lord Methuen laid the first stone of the Institution already referred to.

Mr. Roberts was a Fellow of the Royal Institute of Architects (elected 1860), and a Fellow of the Society of Antiquaries. He was intimately concerned, in connexion with Mr. G. R. Wright, in the foundation of the Junior Athenæum Club, and converting for its purposes a house in King-street, St. James's. When the club removed to Hope House, in Piccadilly, he designed, amongst other works there, the very handsome and commodious Smoking-room which the club possesses.

The subject of our notice had been elected an Associate of the British Archæological Association in 1856, and became one of the Hon. Secretaries in 1862. From that time he attended the Congresses very regularly, and contributed greatly to their success by his lucid description of ancient buildings visited on those occasions, the salient points of which he laid hold of with much facility, and pointed out with equal felicity. The Journal of the Association contains many papers contributed by him, some illustrated by his measured drawings. He took part in the last Congress, that of Evesham, though it was obvious to his friends that his health was in a serious condition. Soon after that event the news reached him of the premature death of his son in a distant country, and the shock appears to have expedited his death. His remains were buried at Kensal-green Cemetery, on Wednesday, the 20th inst., when besides the members of his family, there came a number of his professional brethren, including Mr. T. Blashill, Mr. Loftus Brock, Mr. Warburton Stent, and others, to pay their last affectionate respects to a departed friend.

Mr. Roberts leaves a widow and three daughters to mourn a very great loss.

* Vol. xii., pp. 346, 347. See also "A Visit to Swindon New Town," p. 289, in the same volume.

WORKS COMPLETED OR IN PROGRESS AT OXFORD.

According to its usual custom at the commencement of Michaelmas Term, the *Oxford Journal* gives a detailed account of the buildin operations of Oxford during the past twelve months. We cull a few particulars of the more important items of the account, which occupies nearly a page of the *Journal*.

At *Christ Church College* a great deal of work is being done by Messrs. Symm & Co., builders, of Oxford, in the way of alteration if not in the way of improvement. In "Tom Quad" all the decayed stonework is being taken away and replaced with new material, and in place of the parapet erected by Sir Christopher Wren, a new one, consisting of battlements in accordance, it is said, with the original idea, is being erected. Shields bearing the armorial bearings of Henry VIII. and Cardinal Wolsey, the founders, and the benefactors of the college, are being placed at intervals, and it is intended to carry out the alteration entirely round the Quad. Over Kilcanon arch, in the north-east corner, a low tower is being erected with a stair turret, for the purpose of giving greater accommodation. Wall-ribs are being inserted upon the original lines shown round the Quad, and upon the old foundations which were discovered some time since the bases of buttresses are being constructed, the intention being at some future time, it is stated, to erect cloisters. The drive round the Quad has been altered to the original lines, as laid down in an old print bearing date 1673, which will have the effect of making it look much larger, besides providing a more direct approach to the various entrance doorways. A new parapet is also being placed upon the hall, with a pinnacle running up from each buttress to show the different bays, and each alternate panel will contain an elaborately-carved design of the arms of Henry VIII. and Cardinal Wolsey. The whole of the work is being erected in Taynton stone, but has been delayed by the strike among the masons in the summer. The architects are Messrs. Bodley & Garner, London, and the clerk of the works is Mr. Fitzwilliam.

In the *Cathedral* two stained-glass windows have been put in—one by Messrs. Clayton & Bell, and the other by Messrs. Morris & Co. A memorial window is shortly to be placed in the north transept, facing the pulpit, by Messrs. Clayton & Bell. The old heating apparatus at the back of the cathedral has been pulled down, and enables a better view to be obtained of that side from the Broad Walk. The doorway into the Dean's house has been removed into the next bay to where it originally stood.

The "Ten Chest" in which the cathedral bells were placed a few years since, over the staircase leading to the hall, still remains, but plans have been prepared for the erection of a tower, a

work which will be ere long commenced. Last year the governing body of Christ Church invited and received plans from six architects, Sir G. G. Scott, Mr. T. N. Deane, Mr. Bodley, Mr. Hugall, Mr. T. G. Jackson, and Mr. Champneys, for inclosing the bells within a more suitable structure. A design for this proposed bell-tower, by Mr. James Fergusson, was illustrated in last week's *Builder*.

At *New College* the first portion of the extensive additions in Holywell-street was completed and occupied at the commencement of this year, the additional accommodation provided being two sets of rooms for fellows, and thirty-eight for undergraduates, besides two large lecture-rooms. A further extension of the building is now in progress, and it is expected to be completed some time next year. The length of the building already completed is 273 ft.; depth, 33 ft.; and the height from footing to ridge, 75 ft. This extension will give twenty-one sets of rooms for undergraduates, with a fellow's house at the west end. The fronts are entirely of Milton stone, and the carved work is being executed by Messrs. Farmer & Brindley. For the purpose of access from the old to the new buildings, a stone groined passage has been designed by the architect, Sir Gilbert Scott, and is now nearly completed, this part of the work being executed in Ancaster stone. Messrs. Jackson & Shaw, of London, are the contractors, and Mr. H. Roome is the clerk of the works.

The enlargement of *Balliol College* has been continued this year by the addition of nine sets of rooms for undergraduates at the west and four for fellows at the east end of the hall. A new hall is in course of erection, the floor of which will be laid with Dennett's patent fire-proof flooring. The hall is 90 ft. by 36 ft. in the clear, and the internal facings will consist of Bath stone. The staircases are of York stone, and the windows of the hall will be ornate in character. The total cost of the enlargements will be 25,000*l*. The architect is Mr. Waterhouse; the builder is Mr. Horsman, of Wolverhampton; and the clerk of the works is Mr. Simmonds.

At *Merton College* extensive works have been carried out during the Long Vacation by Messrs. Fisher & Hobdell, builders. The fine old tower has undergone restoration, the old stonework having been removed over about three-fourths of its surface to the depth of from 7 in. to 1 ft. and replaced with new Milton stone. The tracery of the windows is entirely new, and oak louvres have been substituted for the old Stonesfield slates. The parapet also has been restored, and in consequence of one of the pinnacles having been partially destroyed by lightning a few weeks ago, it has been determined to fix one of Newall's patent conductors to each pinnacle.

The last new block of buildings at *Keble College*, containing accommodation for thirty-seven undergraduates and three tutors, will be ready for occupation this term. This block is built in the same style as the other parts of the college, but differs from it in being an extra story higher. The residence for the warden will be at once begun at the south-east corner of the college site. It is intended, if possible, to open the chapel on St. Mark's Day (April 25) next year, and it is also proposed at the same time to lay the first stone of a new dining-hall and library, which have been lately offered to the college by an anonymous benefactor. These will occupy the site of the present temporary chapel and dining-hall on the south side of the large quadrangle, and will divide the two quadrangles of which the college will hereafter consist. Mr. W. Butterfield is the architect for the whole of the works; and the builders are Messrs. Parnell & Sons, of Rugby, Mr. Bond being the clerk of the works.

At *Brasenose College* a new Bath stone parapet has been erected upon the Hall, and a new oak roof has been placed round the front quadrangle. Messrs. Wyatt & Son were the contractors.

A considerable amount of work has been executed at *Wadham College* by Messrs. Wyatt & Son. The old chimney shafts in the front have been removed, and new ones built in Bath stone. Some old outbuildings have been removed for the purpose of enlarging the back quadrangle.

At *All Souls' Chapel* the restoration of the reredos is still in progress, and Mr. E. E. Geflowski, the sculptor, has completed the central piece, which consists of a Crucifixion group in high relief.

A new lecture-room, 31 ft. by 16 ft., has been erected at *St. John's College*, and other works have been carried out by Messrs. Wyatt & Son.

The south end of the Library of *Jesus College*, facing Market-street, is being restored in Bath stone by Messrs. Wyatt & Son.

At *St. Mary's Church* important works of restoration will, it is authoritatively stated, shortly be commenced from designs by Sir Gilbert Scott; the total cost will be about 18,000*l*.

St. Mary Magdalen Church has undergone considerable repair and restoration, under the superintendence of Mr. Wilkinson, architect. The old stone slating has been removed and replaced with Westmoreland slates, the tower has been re-roofed and repaired, and the bells have been re-cast and re-hung by Mr. White, of Besselsleigh. In the interior, the gallery at the west end has been removed, together with all the old pews, and the old vestry walls under the tower have been taken away, and a new vestry provided in the south aisle. Messrs. Wyatt & Son were the contractors, and the total outlay was about 2,000*l*.

The ancient tower of *St. Michael's Church* having been found, upon examination by Mr. Bruton, architect, to be in an unsafe condition, a plan was designed by that gentleman of tying together the structure by a cradle of oak timbers within the walls. Three ancient windows were opened during the progress of the work. Mr. Selby, of Oxford, builder, has carried out the work.

The enlargement of *Summertown Church*, to the extent of about 150 seats, has been carried out by Messrs. Franklin & Sons, of Deddington, from plans by Mr. G. E. Street, R.A. The west and north walls of the nave have been taken down, and the nave has been extended westward about 20 ft., and a new aisle built on the north. A new organ-chamber and vestry are built on the north of the chancel, and provision has been made for the reception of Haden's heating apparatus. The total cost will be about 1,600*l*. Plans are in preparation for a new porch.

The Roman Catholic *Church of St. Aloysius* has made considerable progress. The architects are Messrs. J. A. Hansom & Son, Brompton, and Mr. Claridge, of Banbury, is the contractor. The style is Early Transitional Gothic, and the materials used are white brick, with Bath stone dressings. Mr. Firth is the clerk of the works.

The new *Chapel of King Edward's School*, Summertown, is being proceeded with, from designs furnished by Mr. Wilkinson, the architect of the school. The style is Early English, the materials used being Gibraltar stone for the walling and Box-ground stone for the dressings. Messrs. Symm & Co. are the builders.

The *Barracks* at Bullingdon, in connexion with the Oxford Military Centre, are progressing rapidly in the hands of the contractors, Messrs. Downs & Co., of London. The entire buildings will cost 50,000*l*., and, it is expected, will be fit for occupation by January next.

A large number of minor works have been completed or are in progress. These include additions to and enlargement of chapels, schools, and public institutions of various kinds, and the erection of many new houses and shops. In all the more important works we have noticed great attention is stated to have been paid to drainage and water-supply and to sanitary arrangements generally.

CRANBORNE CHURCH.

The new chancel of the parish church at Cranborne, in the county of Dorset, dedicated to St. Mary and St. Bartholomew, was opened on the 9th inst., by the Bishop of Salisbury. The early records of this very ancient church are to be found in the chronicles of Tewkesbury Abbey, from which it appears that in the year 930, during the reign of King Athelstane, a small monastery was founded there, which was afterwards incorporated with the Manor of Gloucester, and conferred by William Rufus upon Robert Fitzhamer, in the early part of the twelfth century, by whom the church at Tewkesbury was built, and who made Cranborne a priory. The church occupies an elevated position near the interesting manor-house of Cranborne, one of the residences of the Marquis of Salisbury (illustrated by Mr. Nash in his "Mansions of the Olden Times"), which, together with the manor, was granted to the first Earl of Salisbury by James I., and from which the eldest son of the Marquis derives the title of Viscount Cranborne.

The present church consists of a western tower, nave and aisles, a chancel and vestry, which probably was in former times used as a side-chapel. The entrance-porch, on the north side of the nave, has a parvise over it. The church, with the exception of the chancel, which has now been rebuilt, is of an early period of architecture, being of the beginning of the thirteenth century; but the fine Norman doorway in the tower remains to show the existence of a still earlier building upon the same site. The chancel was of very much later date,—the fifteenth century,—and there is also some late work in the tower, though of a somewhat earlier period.

The chancel having become quite dilapidated, has been taken down and rebuilt upon the old foundations. The vestry has been enlarged, and an organ-chamber added on the north side to receive the organ, which was formerly placed in the tower, and greatly obstructed the view of the west window. The new walls are built with brickwork faced with flints, and the new chancel arch, the windows, doorways, and other details of the new work are of the Early English period of architecture, the same as the nave and aisles, and are executed in Tisbury and Bath stone, with Devonshire marble shafts on the inside. A new open-timbered roof has been substituted for the former low plastered ceiling, and new oak seats have been provided instead of the old benches. The floor of the chancel, which was lower than that of the nave, and extremely damp at most times, has been raised and paved with encaustic tiles. The surface of the surrounding ground has been taken off for some distance from the church, and the area of the burial-ground largely increased by the removal of the south wall of the churchyard to a further distance, which enables the fine proportions of the edifice to be seen to much greater advantage.

The works have been carried out at the expense of the Marquis of Salisbury, under the direction of the architect, Mr. David Brandon. The contractors were Mr. Kilford, of Cranborne, and Messrs. Bleathman & Son, of Wimborne; Mr. W. H. Chapman having acted as clerk of works.

The entire area of the church is now warmed by a combined system of warm air and hot water, the apparatus having been supplied by Messrs. Haden & Sons, of Trowbridge.

HOUSE SANITATION.

Amongst the remarks made by Mr. Eassie, C.E., in the paper which he read at the late Social Science Congress at Brighton, he pointed out some of the many mischievous mistakes which are made in the choice of sites. He said,—Where, unfortunately, a house too good to abandon has been built upon marshy land, the land should be systematically drained, and the surroundings of the house planted with vegetation which has been found to rapidly absorb moisture. The Eucalyptus and Helianthus have been found especially useful in this way. All plants and flowers possessing green leaves and aromatic odours are also proved to yield ozone when exposed to the sun's rays, and this agent is malaria's deadliest foe. There is also the rising wet and the drifting wet to keep out of the walls of the house, and this is only to be achieved by using damp-proof courses a little above the ground line, and by adopting hollow walls. Impervious walls are a mistake; for the constant vapour given off in the house will condense inside and soak into the walls, and not allow it to be passed through the pores to the outside. In like manner the new washable wall linings and water-proof paper-hangings are objectionable for the inside of exterior walls. The last kind of dampness which he would notice was that which resulted from the absence of proper area walls, and by the banking up of damp earth against the basement walls. No cure exists for this state of things in the way of damp-proof washings, nothing but the interposition of an area space. When a stone cellar-floor has been laid upon the bare ground, or what is just as common to discover, a wooden ground-floor, the resulting chilliness is unbearable, and when "motley" like this has been the wear, the only cure is concrete. Houses, too, are far too frequently partially built of old materials, and for the most part these old and sodden bricks and brick-bats are used up in the interior partition walls; nor is that all, for the old plaster is commonly worked up with the new to facilitate setting. This is fruitful source of evil, and has been alluded to as accounting for a good portion of our metropolitan mortality. In the author's opinion, these old bricks should never be used until they have been set up again kiln fashion

and cremation performed upon whatsoever of organic matter they contain.

Speaking of the dust-bin nuisance, or what he called the dry cesspool nuisance, they were mostly boxed up in close areas, and near cisterns, to await the dustman's leisure. It would be wiser to provide two movable dust-bins, one for the reception of ashes and house-sweepings proper, and another for the vegetable and kitchen refuse. This would not only save a great deal of labour to the parish in sifting at the dust-wharfs, but would prevent an incipient putrefaction in the dust-bin itself. We cannot be too careful about the air we breathe, for infection takes place through respired air as well as by inoculation, and enteric fever is associated as well with the pollution of air as of water. Disinfectants are all very well; but it is doubtful whether anything can disinfect the air or render inert the evil agent,—whether, in fact, the atmosphere which is found necessary to destroy contagion is capable of supporting human life. Even the more legitimate dust of the house is mostly charged with matters which might develop into disease if rendered putrescible. We should, therefore, get rid of all dust, the innocence of which it is impossible to test. Cleanse it from our floors, shelves, and cupboard-tops, and not dry-dust, which is simply moving it policeman-fashion, onward; but wipe it with wet cloths. House dust is also sometimes rendered poisonous by the fluffs given off from wall-papers, arsenite of copper from green flock papers, and coralline from wall-papers when an arsenical mordant has been used to fix the red colours.

It ought to be an invariable rule, where well-waters are in use, to have them analysed; for no care during inspection can possibly reveal the many chance agents of underground pollution. Fully two-thirds of these supplies are found to be dangerous to health. It is not always safe to say that, because no apparent source of evil is to-day visible, a well yields an immaculate supply. The author had occasion lately to suspect, from its very sparkling character, the water taken from a well in a very healthy-looking position, which supplied several families and a large dairy, and had the water analysed. Professor Wanklyn's report upon it was that it was absolutely poisonous, and then it was found that the constant drinkers of this water had long been suffering from a skin disease. Inquiry also revealed that a farm-steading had formerly stood there, and we can guess what these used to be in the olden time, and that the subsoil was therefore full of impurities. No amount of filtering could render water of this kind pure. Filters can be made useful, without doubt; but, even they must be examined periodically, and a proper material chosen. He had an analysis made of some water drawn at the butler's pantry in a nobleman's house, and it proved that the filter in use, with its impure animal charcoal contents, actually rendered a pure supply from the mains unfit to drink.

Speaking of the gas-supply of our houses, which has at no time as yet received sufficient attention, Mr. Eassie made bold to say that if the houses of London were carefully tested, not a twentieth part would prove free from escapes of carburetted hydrogen. A few weeks ago he had a partially new house tested for a client, before occupation, and found five very serious leaks in the partitions where mere smell could never have detected them. It is not an uncommon thing to find families who have been suffering for a long time from this slow poisoning. It takes one part of gas to eleven of air to constitute an explosive compound; but an atmosphere containing one-fifteenth of coal-gas will cause the death of a rabbit in a very few minutes. There can be no doubt that numbers die annually amongst us from this fatal carelessness; and amongst the other diseases brought on by gas-poisoning, Dr. Lockie enumerates congestion of the brain and kidneys. The author would therefore say to all those who burn gas, test your gas-pipes without delay, and see them tested in the only safe way,—which is by stopping up all burners but one, and fixing upon that a mercury-gauge, connected with a pump, nor resting satisfied until, when a little ether is introduced into the pipes, its escape cannot be detected, and until no subsidence of reading can be noted on the gauge. In some towns of America the gas companies will not lay the gas on until their inspector is satisfied in this way that no escape is possible; whereas with us, the gas companies do not seem to care a brass farthing whether the house-pipes leak or no, provided that they sell their gas. The system which he explained ought to be practised by every gas-fitter, nor should a gas-fitter be allowed to practise unless certificated and in possession of this contrivance. With us a gas-fitter is sometimes a blacksmith, whitesmith, glazier, brazier, plumber, and bell-hanger, all rolled into one. A common force-pump, however, is not the kind to use for testing a gas-service. And he mentioned this lest the hint he gave might induce some householder to have recourse to it. It was a crying scandal to be obliged to say it, but he was certain that not one gas-fitter in a thousand ever heard of any scientific method of testing pipes after they had been laid down between floors or spiked up in the walls. In country houses coal-gas should never be used, but rather the oil-gas apparatus, which was not only one-third the cost, but was pure enough to use in the finest exotic-stocked conservatories. In Lancaster this gas had been in use for years in many houses, and even in factories, and he had inspected several large establishments thus supplied.

THE PRIZES OF THE COMPANY OF TURNERS.

The offered prizes of the Worshipful Company of Turners were mentioned in our columns some time ago, and on Saturday last the Lord Mayor presented them to the successful candidates; that is,—the first prize, silver medal and freedom of the Company and City of London, to Mr. George Thomas Norris; second prize, bronze medal and 5*l.* 5*s.*, Mr. Andrew Foster; third prize, bronze medal and 4*l.* 4*s.*, Mr. William Ripley; fourth prize, bronze medal and 3*l.* 3*s.*, Mr. Stephen Davis; certificate of merit and 3*l.* 3*s.*, Mr. Chas. Paine; certificate of merit and 2*l.* 2*s.*, Mr. T. G. Olley, Mr. Joseph Bailey Willis, Mr. F. W. Hubble, Mr. Thomas Royffe, Mr. A. Capell, and Mr. John Hegley.

The judges were Mr. Charles Hutton Gregory, past president of the Institution of Civil Engineers; Mr. John Holtzapffel, Assoc. I.C.E.; Mr. John Jaques, Mr. W. H. Northcott, and Mr. Thomas B. Winser.

The exhibition was very satisfactory as a whole. Mr. G. T. Norris, the chief prize gainer, showed some very fine workmanship, but the design of some of his specimens might have been better.

METROPOLITAN ASYLUM DISTRICT COMPETITION.

The Asylums Board have adopted the report of the committee upon the designs sent in for the proposed school for imbecile children at Darenth, selecting the design submitted by Messrs. A. & C. Harston.

The committee say :—

"The managers will remember that the Local Government Board, in their letter approving the instructions to the architects, suggested the advantage of breaking up the building into a number of separate blocks, each containing from thirty to forty children; and your committee, having regard to this suggestion, with which they fully concur, and to the General Instructions approved by the managers, laid down, before proceeding to the examination of the designs, certain fundamental principles which they agreed should guide them in estimating the merits of the competing plans, and in determining which of them should be recommended to the managers for adoption."

And they arrive at the conclusion that the design selected far exceeds that of any other competitor in meeting the principles laid down. A cheque for 50*l.* was sent to each of the five architects who submitted designs.

THE BRIDGE ACCOMMODATION ACROSS THE THAMES, AND EAST LONDON.

The authorities in the East of London are actively moving on the bridge question and the alleged insufficient means of communication for the traffic between the north and south of the Thames east of London Bridge. The subject was discussed at the meeting of the St. George's East Vestry, last week, on a recommendation of the Works Committee that the Vestry should express a decided opinion on the matter to the City authorities. Mr. Collyer, one of the members, observed that those acquainted with the City of London, and who knew the large amount of traffic from the East and North of London, in order to pass to the south of the Thames, would admit that the proposed alteration to London Bridge would not afford any relief, because the narrow approaches, which were constantly being blocked up, would be left in the same condition as before. Feeling this was the proper moment to initiate action, he urged that there should be no lukewarmness on the subject, but that the Vestry should take it up promptly, and invite the co-operation of the other East London Boards. Property increased in value rapidly, and in twenty years that task would be impossible which was only difficult now. A resolution to the following effect was unanimously adopted :—"That this Vestry, composed as it is of men actively engaged in trade, having business and other connexions in various parts of London, can testify from experience that the present bridge accommodation across the Thames, and the approaches thereto, are totally inadequate for the heavy and increasing traffic, and having observed that the subject is now receiving the earnest attention of the City Corporation, desires to submit its opinion that the only substantial relief for the present congested traffic eastward of London Bridge is the adoption of the scheme generally known as Mr. Hayward's plan, viz., the construction of a bridge across the river, eastward of the Tower, with suitable approaches.

THE SANITARY CONDITION OF THE PEOPLE.

Mr. C. E. Parker-Rhodes read a paper on this subject at the Social Science Congress, Brighton, on the 12th inst. The following is an abstract :—

Whilst considerable improvements have been introduced into all our public works and private and commerical buildings, the condition of the working-class dwellings has been overlooked, and it is only by national legislation during the present Session of Parliament that an attempt is to be made to remedy the evil. The new Act is wholly inadequate to accomplish the work projected, because it will only remove the causes of disease, epidemics, and immorality from the present localities to others. To pull down dilapidated and insalubrious buildings by Act of Parliament is simply to add to the wretchedness of the laborious tenants, and is, in fact, no remedy whatever. Without any good result for the working-class, it is a costly experiment that will fall heavily on the already burdened ratepayers where the scheme is to be carried out, and will become a new channel for speculation. This new Act is a severe reflection upon all previous Governments for their legislation in sanitary matters, and upon the municipal authorities. If the condition of localities is such as to demand the urgent legislation of last Session, to which other important measures had to give place and to be withdrawn, either previous Acts of Parliament or the municipal authorities have proved to be powerless to prevent this state of things. It is quite true that our labouring classes are huddled together,—parents and children of all ages, strangers of both sexes, the healthy and the diseased,—in one room, without other daylight than that obtainable between high walls, without ventilation, without sewerage, without water and gas, with one privy common to some thirty or more inmates, and that only divided off by a thin partition from the entrance and the overcrowded rooms. Can it be otherwise than true that "fevers and diseases are constantly generated there, causing death and loss of health, not only in the courts and alleys, but also in other parts of such cities and boroughs?" The condition of the inmates can only be in accordance with such dwellings, and that result must inevitably be (notwithstanding all the medical science and treatment resorted to) unchecked disease and sickness and premature death.

The Artisans' Dwellings Act in Liverpool.—At a meeting of the Liverpool Health Committee on the 21st inst., the engineer submitted a report for placing a district of the town, known as Nash Grove, under the operation of the Artisans' Dwellings Act. The area is situated off Scotland-road, one of the lowest parts of the town, and it contains about 22,487 superficial yards, 18,770 of which are covered by low-class dwellings or yards, in use for trading purposes. Allowing for the removal of existing buildings, the engineer estimates the cost to the corporation of acquiring the site, sewering, and paving, at about 92,600*l.* From this amount has to be deducted the value of the land for building purposes after the alteration, which is estimated at 30,746*l.*, leaving 62,254*l.* as the actual cost of the improvement. After some discussion the report was adopted.

PARISIAN PAPER-STAINERS.

Though scarcely a century has elapsed since the French first attempted to manufacture paper for the decoration of houses, this industry has developed itself with the greatest success and rapidity. The origin of cheap paper, suitable for covering the walls of apartments, may be traced to China and Japan, and was imported into Europe by the Dutch and Spaniards towards the middle of the sixteenth century; but it was only in 1760 that a means was found of applying colour to paper which contained a varnish that could prevent the dust from adhering. The creation of this style of paper and this industry in France is due, it will probably be remembered, to M. Réveillon, whose name, however, is perhaps better known as one of the first victims of the great revolution, and to M. Louis Robert, who invented, in 1799, a machine which produced sheets of paper of indefinite length. Like his predecessor, M. Robert was not altogether fortunate in his enterprise. His life was spared, but his country did not manifest any gratitude for his useful conception; and it was not till the year 1803 that, having abandoned France, he found in England the necessary friends and capital to make a practical application of his invention. Eleven years later this French patent was re-imported into France by M. Didot-Saint-Léger; and in 1827 there were four paper-mills where the Robert machine, modified and improved, was constantly employed. In 1834 the number of machines was increased to twelve, and now there are more than 230 in France alone. M. Chapelle, M. Causon, and M. Mongolfier are the most prominent promoters of this industry, and paper is now but rarely manufactured by hand. If in the adoption of new machinery the French have not been so prompt as the English, it must be admitted, on the other hand, that they have not failed to encourage the artists who draw the designs from which the paper is copied, and that in this department they have won the highest commendation. After M. Réveillon, his successor, M. Jacquemard, and M. Oberkampf, of Jouy (Seine-et-Oise), devoted their talents and energy to improvements in the art of engraving for industrial purposes; while among the modern notabilities, Dufour, Mader, Délicourt, Defossés, Zubert, and De Mulhouse, won for French paper a European reputation. At present there are in Paris about forty manufactories of coloured paper, employing from 680 to 700 printers, and some 400 men to feed the machines, &c. There are also workmen and women specially employed for gilding the paper, which is at once delicate and dangerous work, though but poorly remunerated. The gilt is laid on in sheets or in gold-dust, the latter being generally made from the spare bits of the former, reduced to powder by brushes used specially for the purpose. This brushing process creates a dust, which falls on the operator, so that his hair and beard are filled with verdigris; and notwithstanding the respirator and other protective measures, he frequently breathes or swallows the virulent poison that permeates the air. Though constantly exposed to this danger, and often reduced by illnesses which sometimes prove fatal, the manipulators of the gilt-dust only earn 2s. 6d. per day.

The regulation of the rate of wages paid in this trade is organised in a peculiar manner, and often engenders sharp practice between the workmen and their employers. Each year a fresh supply of samples is given to the travellers of the different firms, and when these are completed a general meeting is convoked in each workshop. The blocks are brought forward one by one, and a debate ensues between employer, his workmen, and foremen, as to the price which should be paid for the making, staining, &c., of paper from each of the different designs. These discussions are not free from the bitterness and animosity which will naturally arise when men are bargaining for their bread. To the workman any miscalculation tending to reduce his meagre wages, signifies in the present state of business, absolute want and distress. There is also another incident which tends to augment the evil feeling. These debates occur during the dull season, that is to say, at the moment when work is so scarce that almost any price is acceptable, and the tariff established under these adverse circumstances is maintained during the busy season, when, but for this previous arrangement, much higher wages would be obtained. Yet the workmen are obliged to submit to the lowest terms, as they are proposed in the dull season, and the employers can then afford to discharge their men at the slightest symptom of resistance, knowing full well that starvation will ultimately ensure their return. During the year the workmen note carefully the designs which have occasioned the most trouble, so as to claim an increase if there be a demand for more of the same paper during the ensuing year; and a workman, who is well acquainted with these blocks, may render the utmost service to his shopmates when discussing the tariffs. Unfortunately the employers do not always act fairly to these their best informed workmen, and sometimes seize an early opportunity of discharging the men who bargain with the greatest ability. In other cases, too much power is given to the foremen, who are left to discharge men at their own caprice, and the employers would always be better served if they took greater and personal interest in their workmen. Notwithstanding, however, the precarious position of the men employed in this trade, they were able to subscribe towards defraying the cost of the artisan delegates who visited the Vienna Exhibition; and M. F. Bouchier, the representative of the Parisian coloured paper-makers and printers, does not fail to establish a comparison in his report between the wages earned in the capital of France and of Austria. M. Bouchier maintains that the workmen receive at least 20 per cent. more in Vienna than in Paris, and that with the superior tools the French employ, they might gain at the same rate of payment, at least 30 per cent. more than they actually receive. The Austrian employers also pay their workmen themselves, which is considered to be a great advantage, as there is a tendency to make innumerable deductions from a workman's wages if it passes through many hands before reaching him. The Austrian printers earn from 14 to 16 florins a week; for the flock and gilt work, 25 to 30 florins, and the week consists of fifty-five hours. In Paris the workmen engaged in this trade also suffer from the grave inconvenience of being obliged to find a boy from twelve to sixteen years old to help them. These children are not always easily obtained, and workmen often lose three or four days in hunting for them. Nor will every boy work with the courage and goodwill necessary; and the printer of coloured paper is therefore not dependent on himself alone, but often finds his best endeavours thwarted through the indolence of his boy assistant. Yet these boys are better paid than they were formerly. Out of the 7 francs now earned, 1 franc 75 cents. or 2 francs must be paid to the boy, thus reducing the workman's wages to about 4s. per day. But, according to the custom of the trade, the workman is obliged to pay his boy's salary even when he is himself out of employment, and this contributes still further to reduce his income. Since 1830, the increase in the wages hardly amounts to 2fr. per day, while the boy-help was only paid 60c. to 75c., instead of 1fr. 75c. or 2fr., so that there remains a balance of only 1fr. increase in the workman's favour. On the other hand, the price of the necessaries of life have augmented by about 80 per cent. during the last forty-three years. Thus the workmen engaged in this trade, notwithstanding the 20 to 25 per cent. rise in their salaries, are infinitely poorer than during the earlier portion of this century. The boy assistants, also, though a source of great trouble to the workmen, are themselves in anything but an enviable position. Many are without parents, or even guardians, and, with no one to protect or to teach him, a boy becomes an easy, ready dupe to some hard taskmaster. It is not surprising, in the face of these distressing circumstances, that the Parisian paper-stainers should resort to the common strategy of workmen seeking to improve their position. They have constituted a Syndical Chamber, which is the French term and form of trade unionism. It is only to be regretted, according to the workmen's version, that this was not done sooner. Had the workmen, represented by a duly-elected and competent syndicate, been able to plead their cause, and give expression to the unity of feeling that subsisted among them, the great strike of 1866 would have been avoided, thus saving the workmen from the direst want, and the employers from ruin.

One of the first grievances to be abolished by the action of the Syndical Chamber is the institution of the *livrets*, and this is of special interest, as many persons have advocated the introduction of the system in England. These *livrets*, or little books, are not certificates as to the workman's capacity, in which case they might be considered useful, but resemble rather a ticket-of-leave. Any change of locality or work is inscribed in the book, both by the employer and the local commissioner of police; thus a workman may be traced from place to place as if he was a criminal at large. It also happens that, during the dull season, a workman is sometimes glad to accept employment in a house where very inferior paper is produced; but when, in more prosperous times, he attempts to return to a first-class workshop, he finds that he has lost standing, the *livret* having disclosed that he has been engaged on common work, and it is hastily surmised he is incapable of doing anything better. Other complaints relate to the insertion of secret signs in the *livret*, by which employers can damage the career of their workmen. Some time ago this occurred with a particular firm, where, at the annual meeting, the employers and workmen had failed to agree on the prices for the designs to be produced during the ensuing year. The workmen were, therefore, obliged to leave. Many among them, however, found it impossible to obtain work elsewhere; and on examining their *livrets*, they discovered that their late employers had marked them with the letter M. or B.

For a long time this cabalistic sign remained a mystery; but, by comparing notes, it was ultimately proved that the workmen who were most stanch in resisting the terms offered by the firm they had left, found the letter M. inscribed in their *livrets*, and the natural conclusion was that M. stood for *mauvais*, or bad; while B. stood for *bon*, or good. Thus, while the *livret* is humiliating to the workman, it does not testify to his skill or honour, but lends itself to abuses, and its abolition is earnestly advocated, not only by workmen engaged in the coloured paper trade, but by all classes of the French prolétariat.

In spite, however, of these disadvantages, the Parisian paper-stainers maintain that in the manufacture of paper used for decorating houses, the French excel any other nation. To judge from the reports of the delegates present at the London Exhibitions of 1851 and 1862, England, after France, assumes the first rank; but, while surpassing other nations, our paper, for composition and perfection, cannot be compared with French produce. This judgment is, we repeat, founded on the experience acquired at the two previous Exhibitions; for at Vienna there was but one English firm represented, and their samples were of a common and insignificant character. The Austrian papers cannot be said to have improved since 1862, and there were some very common articles exhibited in a careless and inelegant manner. Hungarian paper was of the simplest, and the gilt affixed failed to shine. Belgian goods were similar to those of Austria, while some of the Prussian paper was well made, but so simple in design and devoid of style that it did not deserve any praise. The German gilding was bad, and altogether it was clearly demonstrated by the Vienna Exhibition that France need not fear the competition of foreign countries. Though many first-class French firms refrained from sending specimens, the French paper was unanimously praised, and many visitors mistook some sheets for silk and others for leather. According, therefore, to the opinions we have summarised above, and which generally prevail throughout the trade in France, the Parisian paper-makers hold the highest position; but the workmen engaged in the craft, though contributing to their utmost in bringing about this success, enjoy a very slender share of the profits.

WINTER EXHIBITION, DUDLEY GALLERY.

The Ninth Winter Exhibition of cabinet pictures in oil at the above-named gallery, opened to the public this week, cannot be considered a very remarkable one, and illustrates what we fear is likely to become more rather than less apparent, that there are too many picture exhibitions at present not to produce an unavoidable lowering of the standard of the works exhibited, in regard to intellectual interest at all events, though there is always a fair average of draughtsmanship and of execution generally. The number of works which have any great interest is certainly not large. Taking the numbers consecutively round the room, we note that Mr. Morris furnishes another contribution to his series of Idyllic subjects in "The Upland Fold" (9), in which the figures are deficient in character, and the tones of the landscape not quite comprehensible. Mr. Val. Prinsep sends, as he did last year, a scene in "The Isle of Wight" (16), remarkably clear in tone and full of light, if a little hard; and near this is a bright

and effective little study called "A Young Tree," by Mr. Adrian Stokes (32), which happily embodies the spirit of Spring in its broken lights, and vivid touches of white blossom. M. Leon Lhermitte's "Cloth Market at Landernau" (61), is a study of a dreary-looking old town with characteristic groups of figures, in that broad and rich though apparently rough style of execution which is peculiar to the artist, and which, in its mingling of depth and luminosity of tint, in the completeness of expression given to the figures and faces by the broadest touches, and in the harmony and unity of the whole in feeling and colour, is, as far as it goes, just perfect; it may be called a "manner," perhaps, but it is the manner of a true artist. Mr. G. F. Watts's "The Days that are no more" (80), is not worthy of him, and has no perceptible relation to the title, which we take to be given for the sake of a title. There is a certain novelty in Mr. Macallum's "Boy at the Helm" (86), a lad seated on the deck of a yacht or coaster on which a strong light falls; it has character in its way. Mr. Severn's effect of light and colour on trees and water "On the Warfe,—Evening" (98), might be labelled "Curious, if True"; it is effective undoubtedly, but strikes us as theatrical. In a very contrary style Mr. Ditchfield's "Cowdray, Midhurst" (99), is a bold and free little painting. We are professedly picking out those that are worth most attention at present, but cannot help asking, in passing, how a painter of Mr. Valentine Bromley's talent can reconcile it to his conscience to send anything so ugly and repelling as "In Maiden Meditation" (104),—such a maiden! Mr. Hemy, whose talent seems to ripen year by year, is excellent in "Along Shore" (105), a line of beach with tide "waste" strewed along it, a lazily curling sea, a couple of dark-sailed coasters, backed by a very distant, soft, and aërial sky. Another work showing original genius we come to in the "Lonely Farm, Sussex" (130), by Mdme. Cazin, who in this kind of subjects, her favourites, shows always a broad and powerful style, and true feeling and poetry of effect. Mr. E. H. Fahey's "Lily and her Butterflies," from *Kenelm Chillingly* (141), is the counterpart of the young lady who figured in "The Path of Roses" in the last Academy Exhibition; there is a brilliant effect produced by the butterflies, and the picture is a new "notion," but the girl wants figure. Near this young woman sits Mr. Leslie's girl in white, this time under the name of "Anthylla" (165), and looking as pretty as usual, but—*toujours perdrix!* This kind of thing is really coming to picture-manufacturing. On either side of this Mr. Whistler puzzles the average spectator by two "Nocturnes" in "blue and gold" and "black and gold" (160, 170), the latter founded on the bursting of a rocket, with masses of fire in the distance; the former a night river-scene with lights reflected. There is genius certainly in these, the river-scene especially; but this artist's fancies are not suited to the uncongenial atmosphere of an exhibition-room. The "Old Dee Mills" of Mr. Bell (164) is a fine drawing, recalling De Wint in subject and composition, though different enough in tone and texture. There is pathos in Mr. Overend's "Men must work and Women must weep" (169), with its wild sea and the two figures at the stormy extremity of the headland. Divers single figures by Mrs. Jopling, of which "Interrupted" (174), is the best, show the artist's usual brilliant execution, though less feeling or sympathy than might be desired. Mr. Albert Goodwin's "St. Michael's Mount," and "The Seaweed Harvest" (201, 259), are fine specimens of his genius; the former a carefully-studied but painfully grey and sombre effect, the latter showing the finest characteristics of the painter. To these we may oppose two works of another original thinker in colour, Mr. H. Moore, whose "Fine Weather in the open Mediterranean" (250) shows a tendency to the exaggeration of a certain phase of marine effect which he has made his own; while "A Surrey Bye-road—Spring-time" (241) illustrates a somewhat new class of subject with him, and is full of fresh atmospheric effect. Mr. Watts's "Found Drowned" (211), a single dimly-seen figure thrown upon the beach, has something of the simple pathos of Blake about it; and among bits of landscape in the vicinity may be noticed Mr. J. D. Watson's "After Sunset" (228), Mr. Sampson's "Berck Sands" (213), Mr. C. Potter's "Welsh Gleaners" (221), and "Landing Fish" (119), by Mr. Henry. "Evening—Waterloo" (234), by Mr. Ernest Crofts, is a noticeable little picture, for its broad style of handling, and the sad tragedy of the dying and wounded groups; as a battle picture, though small, it is the reverse of commonplace. Mr. Burgess has intended real pathos in his "School Teacher" (290), an over-worked and weary woman come to the open door for a moment with her book, to seek air and refuge from the noise; the picture scarcely comes up to its aim, but has feeling and originality. Mr. Joseph Knight's "Sandhills" (296) is the best and most typical example of a style of subject he seems to have given himself up to; it is very good, but not an effect that will bear such frequent repetition as it obtains. Further down we come to what we should call a "corner of horrors," which we pass over lightly. Mr. Harry Goodwin's "In the Lonely Vale of Streams" (371) in the opposite corner is a small picture showing much feeling and richness of colour, and near it Mdme. Cazin's "Evening" (378) is a remarkable little work; the sea seen from an eminence, with dark-sailed craft creeping over it, their hulls and reflections blended in the waning light; there is something quite unusual in the tone, feeling, and effect of this work. Mr. Waterlow's "Summer Evening on the Thames" (393), a tolerably large work, shows an advance on the artist's previous oil paintings in colour and individuality of style. On the screen, amid a number of very infelicitous productions, a small picture by Mr. Heywood Hardy, "Not to be Caught with Chaff" (419), shows a degree of refinement of effect, and point and character in treatment, unusual in equine pictures; and immediately beneath this Mr. Alma Tadema catches the eye with a "Breezy Day in August" (420), a flat, fresh, green field bordered by straggling trees in the true "English country" style. This painter, who thus steps out of his usual path, has in turn been invaded on his own ground by Mr. W. S. Coleman, whose "Butterfly Collector" (308) is certainly inspired by Mr. Tadema. Among small things that pleased us may be mentioned "A Thames Backwater" (4) by Mr. Grace; "Studies of Colour," by Mr. Macquoid (5), and the same artist's "Drying Onion-heads, Brittany" (149); Mr. Chas. Earle's "On the Beach at Beer" (175), Mr. Glennie's "Coast of Thanet" (176), and others.

THE WORSHIPFUL COMPANY OF COACHMAKERS.

Having been invited to look at some drawings, for which premiums had been given by the above-named company, and which were stated to be on view at their hall, in Noble-street (Aldersgate), we may say a word as to the habitation of the company, and their recent endeavours to encourage ability among the apprentices and workmen of the important manufacture which they represent.

The Coachmakers, though not possessing the wealth of some others of the City Companies, are an old and respected guild, with a history of some two and a half centuries or so behind them. Their "Hall" in Noble-street, without the sumptuous style of the wealthier companies' habitations, and presenting a very unpretending front and entrance-door in the narrow street running parallel with Aldersgate-street, has its own interest. It stands on the site of the house of Sir Nicholas Bacon, the father of the great Bacon. The present building is an old one, carried up higher, the company having bethought themselves five years ago of making a little revenue out of their property; and accordingly, under the direction of Mr. F. Chancellor, architect, the buildings were carried up, and the company are now lodged on an upper floor, utilising the lower floors as warehouses. Much of the internal fitting of the rooms is old, however; and the principal, or "Court" room, contains massive wainscot and other woodwork of Old English Classic type, transferred from its position in the original rooms; and an old chair of state of the Master of the Company, preserved as a relic of its former days. The room is lighted by a glass dome, filled with coloured design in panels, of Pompeian character, and in a style rather unusual in stained glass. The dome is capable of being lighted outside at night so as to throw the light into the room through the glass, and not lose the effect of the design. The small ante-room contains a rather carefully designed little stained window, by Messrs. Lavers & Barraud, showing various incidents in connexion with the history of the company.

From the memoranda appended to the list of officers, &c., for 1875-6, it appears that for some years past the company have been making efforts "to stimulate skill and ingenuity among those engaged in the trade of coach-making, and to encourage technical education." To this end an "Operative Coachmakers' Industrial Exhibition" was held in February, 1865, and opened by the Marquis of Lansdowne and the late Dean Milman. In 1866 the company voted medals to be awarded by the examiners of the "Society for the Encouragement of Arts, Manufactures, and Commerce"; in 1868 they made a grant of money to commence a library of reference for the use of coachmakers; in 1869 a grant of medals to the Society of Arts, and also to the Science and Art Department at South Kensington; and in the following years various prizes have been offered for technical and free-hand drawing; and in 1873 prizes were offered for the best reports, by foremen, clerks, workmen, or apprentices in the trade, on the International Exhibition of Carriages at South Kensington. In the present year medals and prizes have been offered for technical and for free-hand drawing; three prizes for the former and two for the latter. The technical drawings, which, of course, are not of much interest except to those learned in the mysteries of carriage-building, are well executed, and show a good deal of care and industry. The prizes for free-hand drawing, we presume, are offered to encourage the use of the pencil generally as a desirable accomplishment; the first prize drawing consists of a copy of a well-known figure entitled "Egeria" (by Mr. Durham, if we remember rightly), but whether from the round or from an engraving there is no evidence; and the others are pieces of classic foliage design. There seems to be no opportunity for cultivating artistic drawing in direct reference to carriage designs, which never are ornamented in any artistic manner, but left to depend on their flow of line and finish of surface and varnish for any beauty they may possess. An eminent English architect, some little time since, designed artistic decoration of an unobtrusive but elegant character for a carriage for some Egyptian potentate; but there is no scope for anything of the kind in England, since any one who attempted to apply artistic decoration to a carriage in this country would at once be set down as either vulgar or eccentric,—charges of which it is difficult to say which is the most heinous. But if the freehand drawing element is intended in this case simply to encourage the pursuit of drawing for its own sake, the promoters of it would do well to look for a somewhat more original and less commonplace order of subjects than is indicated by the drawings we were permitted to see, and which, except the figure referred to, were merely the old Roman scroll ornament, by which, from time immemorial, free-hand drawing seems to have been taught.

The library of the company is open to any visitor on Saturday afternoons, and among objects of interest in it are some large portfolios of drawings, engravings, and photographs, representing every known form of wheeled carriage, past and present, from all parts of the world, even down to the wheel-barrow; and what may be called the "comparative anatomy" of carriages illustrated by the collection presents a good deal of interest, and is curiously indicative of the national character and customs of some of the people who have invented and use the various forms of vehicles.

HYDRAULICS.*

Water flows out of a hole in the side or bottom of a cistern with a velocity which is nearly equal to that of any heavy body falling from a height equal to that of the surface of the water above the centre of the orifice. The velocity in feet per second of any such heavy body is 8 times the square root of the height in feet (more exactly 8·025), or the velocity in inches per second is 27·8 times the height in inches. This is called the theoretical velocity; the actual velocity is less, because of the friction of the water against the edges of the orifice, and of the disturbance of the particles of water.

Mr. Neville has given so much attention to the flow of water under the many various circumstances of practice that what he says may well be accepted as conclusive, and in respect of the velocity we have just referred to he says it is as near the theoretical velocity as ·974 is to 1. It is therefore $·974 \times 8·025 \sqrt{h} = 7·816 \sqrt{h}$,

* "Hydraulic Tables, Co-efficients, and Formulæ." By John Neville, Civil Engineer, M.R.I.A., &c. Third Edition. London: Lockwood & Co. 1875.

when h, the height, is taken in feet, or when the height is taken in inches, it is $27{\cdot}077\ \sqrt{h}$.

But it is to be observed that the velocity thus found does not take place in and through the orifice itself, but at a short distance outside it, at a distance of about half the diameter of the orifice, at which point the sectional area of the issuing stream is contracted. The degree to which the sectional area is contracted is given variously by investigators as follow, the sectional area of the orifice being = 1; that of the issuing stream at the most contracted point is deduced from the observations of Newton to be ·707; Poleni, ·7156 to ·622; Borda, ·6432; Michelotti, ·64; Bossut, ·656 to ·669; Du Buât, ·667; Venturi, ·637; Eytelwein, ·64; Bayer, 617. In general it is not well to take average quantities, they so often lead to error; but really the circumstances of water-gauging are so various that the conditions cannot be shortly stated in any other way. If, then, we take the mean value of the above-named co-efficients of contraction, it would be about ·65; and if into this we multiply the co-efficient of velocity, viz., ·974, we obtain a co-efficient of discharge = ·63 or thereabouts. To ascertain the actual discharge, therefore, we should multiply the following quantities into each other, viz., the area of the orifice, the height from the centre of the orifice to the surface of the water, the constant number 8 (or 8·025) being the square root of twice the velocity which a heavy body attains at the end of one second after the moment of its being released from a state of rest; and the co-efficient of discharge, which we take to be ·63. The result, in cubic feet per second, will be found to be very nearly five times the square root of the height in feet multiplied into the area of the orifice in feet.

But this is a mere outline of the case; the variations are numerous, according to the forms of orifices and other circumstances, all of which are fully set forth in Mr. Neville's comprehensive treatise. The author also investigates with equal minuteness the conditions of the flow of water over weirs, and over notches in thin plates of the usual rectangular form; and also gives Professor Thomson's formula for triangular notches, which is $Q = {\cdot}317\ \sqrt{h^5}$, when Q = the quantity passing over per minute, in cubic feet, and h the head of water in inches, as measured vertically from the still water level of the pool down to the vertex of the notch. This formula was given at the meeting of the British Association at Leeds in 1858 for a right-angled triangular notch, for discharges of from 2 to 10 cubic feet per minute. The author of that paper then very truly said that "the ordinary rectangular notches, accurately experimented on as they have been, at great cost and with high scientific skill, in various countries, with the view of determining the necessary formulas and coefficients for their application in practice, are for many purposes suitable and convenient. They are, however, but ill-adapted for measurement of very variable quantities of water, such as commonly occur to the engineer to be gauged in rivers and streams. If the rectangular notch is to be made wide enough to allow the water to pass in flood times it must be so wide that for long periods of moderately dry weather the water flows so shallow over the crest that its indications cannot be relied on. To remove, in some degree, this objection, gauges for rivers or streams are sometimes formed, in the best engineering practice, with a small rectangular notch cut down below the general level of the crest of a large rectangular notch. If now, instead of one depression being made for dry weather, we use a crest wide enough for use in floods, we conceive of a large number of depressions extending so as to give the crest the appearance of a set of steps of stairs; and if we conceive the number of such steps to be infinitely great, we are led at once to the conception of the triangular instead of the rectangular notch." The formula above stated was submitted temporarily as being accurate enough for use for ordinary practical purposes, and for quantities of water limited to nearly the same range as those in the experiments which Professor Thomson made; but as being, of course, subject to amendment by experiments extending through a wider range of quantities of water. Mr. Neville says,—"The great advantage of the triangular notch for gauging is, that the sections for all depths flowing over are similar triangles, and therefore the co-efficient probably remains constant, or nearly so, not only for one, but for all species of triangles, when the depth at the apex is not very small indeed in proportion to the width flowing over at the surface."

To revert to the consideration of the flow of water out of orifices, the effect of rounding off the inner edges of the orifice is to increase the quantity flowing out; also the quantity is increased by adding to the outside of an orifice, in a thin plate, a short cylindrical tube, the length of which is from one and a half to three times its diameter, to a degree which is "nearly an arithmetical mean between the theoretical discharge and the discharge through a circular orifice in a thin plate of the same diameter as the tube, or ·814 nearly." The authority of Mr. Neville on this subject is so high that one ought, perhaps, to apologise for the question, whether this co-efficient is not overstated. He has previously stated that Bayer's value for the contraction, ·617, coincides pretty closely with experiments, and if we multiply this value into the author's value for the velocity, ·974, we obtain a coefficient of discharge = ·60, and the arithmetical mean between this and the theoretical value would be ·80.

One of the most important parts of this book is Section VIII., treating of the flow of water in uniform channels; the hydraulic mean depth; the border; what constitutes "train" in a river; the hydraulic inclination; the effects of friction; formulæ for calculating the mean velocity, and application of the formulæ to the solutions of three useful problems.

The *hydraulic mean depth* is the same measure as the *mean radius*, and for cylindrical pipes flowing full, or rivers with circular beds, it is always equal to half the radius, or one-fourth of the diameter. A river or stream is said to be "in train" when the inclination of its surface bears such a relation to the cross section that the mean velocity is neither accelerated nor retarded by the length of the channel; for the acceleration that would be caused by the inclination is exactly counterbalanced by the resistances, and these are proportional to the length; so that when a river or pipe is in train it might be cut at any part of its length without altering the quantity of water discharged. It is very necessary in short channels and pipes not to mistake the inclination of the bed for the hydraulic inclination. In long pipes or channels, say 1,000 diameters in length, the whole head may be divided by the length to find the inclination or slope, without sensible error; but in every pipe or channel there is a certain head due to the orifice of entry and velocity in the pipe, as well as the greater head due to the resistance of friction, and in short pipes the head due to the orifice of entry and the velocity is a sensible part of the whole. By neglecting this distinction, sound and accurate formulæ, such as that of Du Buât, of which Mr. Neville speaks very highly, as giving results very nearly in accord with his own experiments, have been wrongly supposed to be inaccurate. In all Du Buât's experiments, the author says he carefully deducted the head due to the velocity and orifice of entry before finding the hydraulic inclination, and those who attempt to calculate the velocity from the head and length of the channel only, without making this deduction, will find their calculated results very different from those calculated from such formulæ. The experiments from which Du Buât's formula was constructed are given in full by the late Dr. John Robison, in the article "Rivers" in the "Encyclopædia Britannica."

The best form of channel, and the regimen of rivers, are fully investigated by Mr. Neville, and the maximum velocity which may be allowed without disturbance of the river's bed is given (p. 258) for various kinds of ground. The experiments of Mr. Mallet on syphons are given, and new formula for finding the discharge from syphons, flood-sluices, and tidal sluices.

The section on water supply and sewers, especially as to the cost of such works, is hardly worthy of the book, but the thirteen tables of the velocities, discharges, heads of water, and other conditions of streams, weirs, and pipes, are excellently well arranged, and a table is given which has been arranged from Mr. Francis's experiments upon a centre-vent water-wheel at the Boott cotton mills, Lowell, Massachusetts. The general principle of this wheel appears to the author to be the same as Thomson's vortex wheel, the guide blades however being fewer in the latter, and capable of adjustment.

Another table shows the results of experiments upon the turbine at Tremont Mills, Lowell, arranged from Mr. Francis's experiments, and another for turbines of different diameters operating with different falls of water.

PICTURES AND THEIR SURROUNDINGS.

It is greatly to be feared, in spite of all our progress, that a good many very common things are still in their infancy. We use the word *common* because the matter we propose to say a few words on is all around us, in different forms, and under conditions more or less favourable or unfavourable. We speak of pictures, and their surroundings, and picture-framing,—a little thought-of, but not a little important element in a picture display; the rooms, or galleries in which pictures are commonly found; and the mode of lighting such apartments more or less appropriately and as calculated to do its work, and to help or to mar the objects for which in many cases such apartments are specially built and decorated. The subject, though as we say common enough, is still somewhat out of the world of artistic discussion. The questions what to do best with pictures when acquired; how, and where to hang them best; and how to look at them under the most favourable circumstances, yet need discussion. These are common subject-matters enough, but how little has been done, and how disappointed at times is the picture-lover when he finds at last the work to please him, but is hardly able, perhaps, to see it,—out of place, in a bad light, or in too glaring a light, or so surrounded by incongruous matters great and small that remedy seems past all hope.

Having the picture, we should feel disposed to take note after it of the frame which surrounds it, for it is impossible to see the one without the other, they both filling the eye at one and the same time. Then there is the wall surface at the back of the picture, helping or disturbing it in no small degree, for it is quite possible to put out all the colour of a fine work by a too glaring background. Then there is the light that must needs come in from somewhere, pleasant or unpleasant, the light being reflected in the picture. Then, again, the mere position of the picture as regards the angle at which the light, come from whence it may, strikes the picture surface. To the artist, at least, this is all-important; he never forgets to look to it while the art work is in his own studio. It is really surprising to think of how many thousands of good pictures there are scattered about in all directions, and in all orders of keeping, that are all but lost from the truly unhappy state of their surroundings, and from the incongruities about them. Even in princely mansions this is found to hold, wealth itself not appearing to be all potent here. In such great picture displays as the annual Royal Academy one, it is of course necessary to sacrifice much for the mere sake of room and wall space, so that complaint as things are, artistically, is perhaps vain; but in permanent exhibitions, whether great or small, we most surely ought to expect better arrangements in all ways.

It would perhaps be hard to instance anything secondary of more importance to its primary, the very cause of its existence, than is a picture-frame. The picture itself is first,—that is certain; but its surrounding frame is so important and telling a part of it that it cannot be neglected: it must be looked at whether we will or no. The very perfection of a frame would perhaps be, could we but imagine perfection to exist anywhere, in its not being noticed at all; but, as all know, it is impossible to go through any fine collection of paintings, or through a noble gallery, or suite of rooms filled with pictures, whether ancient or modern, without being struck more or less with the "frames" which surround the at times priceless pictures. We have all heard of how at times things so secondary as they seem become important when the causes of them are but partially or dimly visible. Sir Humphrey Davy, a man of science, but not of fine art, saw picture-galleries as others did, but his remark on the show was but an exclamation of wonder at the "extraordinary display of fine frames." He, indeed, saw nothing but the gilded frames. So much has been said and written about "colour" by those who see somewhat deeply into the things of art, that it may seem surprising that more has not been said and written on the subject of the "frames" which hedge pictures round, and at times, truth to say, well nigh kill their colour. Let any who care for these things consider it well. We may be thanked for calling attention to picture-frames, if but the too heavy and too gorgeous gilding were removed,—if only for experiment's sake,—from round and about some pictures we could name, and the pictures were seen in their full force and beauty. What would Davy have said had he been compelled to look at the pictures?

And now for a thought on the "gallery," or room, in which the picture is exhibited, and on the wall of which it is hung: the colour and nature of the wall-space, and, more than all, the kind and amount of light which comes in to make the picture either visible or invisible, for it does at times come even to this pass. It is really a matter to be wondered at to see how great a difference there is, as it seems, between the same picture as seen by the eye in a good light, and the same picture in a bad light. It is not to be estimated in words. None, perhaps, but the workman himself,—the executive artist,—can realise this difference to the full. To see a fine picture in the studio of its painter, without its future broad and massive gilding round it, and on the easel on which it was painted; and, more than this, in the light carefully tempered and regulated, which satisfied the eye of him who painted it; and then to see the same picture in another place, with all its new surroundings, is to see another object! No wonder the workman trembles at times as he sees his cunning work pass away from his own keeping into that of others, not quite so knowing as himself, and not quite so deep in the mysteries of art. It is possible to kill a good picture by the very size and heaviness and coarseness of the details about it, more particularly if it be a small one, and very delicately and lightly painted. We have been powerfully impressed at sundry times with this fact. The room or gallery should be subdued to the picture, and be compelled to harmonise with it, in colour most surely, if not in form and details. A fine-toned painting makes a dull walled room live.

But if all this, and so much more, may be said of picture-placing and exhibiting in the quiet home corners, what shall be said of great galleries, and whole suites of gorgeous and elaborately-furnished rooms, wherein every object far and near comes almost of necessity into the field of view,—the floor, the ceiling, the walls, furniture of the most costly kind, and even massive chandeliers, all competing with the picture? In some fine picture displays which we could name, the really noble pictures are all but lost, and the eye needs to be shaded to fairly see the cunning work in each one of them. Now and then it happens a special and most convenient picture-viewing apparatus is provided for the smaller pictures. This is not simply, be it observed, a purely artistic problem: it is a scientific one as well, for it includes in it the very nature and construction, and use of the eye itself. The eye cannot see clearly all the objects before it at once. A something is always wanting in clearness of definition, and one bright colour is found sometimes to help, but sometimes to kill or to change at least, another near it. Some of these optical effects, scientifically looked at, are exceedingly interesting, and not a little curious and startling. It would be well if some experiments could be systematically made to test them, and a record made of the results. If generally accessible, they might serve as guides and cautions to very many who have control over these things. A picture, be it observed, is a brain thought, let into a noble room, always present, and surely mere "upholstery" should give way to it.

But if all these influences bear so heavily at times on the picture, of whatever order it may be, still more important is the influence on it of the light which serves to render it visible. A picture seen by sunlight, one seen by the light from a pure blue sky, and one lighted up from a sky-light filled with ground glass, or the light from a dull cloudy sky, will change its colour in a very surprising way. This may at times be tested in our public galleries, and the varying effects noted. A pure colourless light is doubtless the one thing needful. A picture then has to rely wholly on its own internal force, and neither gains nor loses. It is simply made visible. It would be well to keep these facts, for facts they are, well in mind. All are now-a-days more or less interested in pictures, and all are therefore equally interested in seeing them under the best possible conditions. Of *light* first of all. And not only is the kind of light which falls on a picture, whether more or less pure, but the degree or quantity of it a matter of no less importance. It is quite possible to throw too much light on a picture surface, as well as too little. In a finely-tempered as well as pure light is to be found the best condition under which a picture can be seen. Whether this finely-tempered light is best admitted through a window in the wall of the room or gallery, or through a skylight in the roof, might well be made the subject of special experiment, for it makes more difference than many would be apt to imagine. A high light in a side wall does its work well.

We have left ourselves but a brief space to note another item which would, if duly attended to, help matters where the collections are large. We allude to the practice of cramming a room with a vast multitude of pictures of all sizes and, at times, of shapes. A picture much above the eye-level is all but lost and invisible; the workmanship of it cannot be seen, and the artistic touch is thus far totally lost; while a picture on the very ground—and things go to this here and there—becomes a matter of positive pain to get at it at all. Of course, all cannot be equally well placed; some must necessarily suffer, more or less, in the press for room where the picture display is a large one; but much might be done to mend matters in very many places we could name. It is better, surely, to be able to see a *few* pictures well, than a whole numberless host indifferently, or hardly at all, from very crowding. When very large canvasses fill nearly the whole wall of a large room, it would seem injudicious to add a number of small pictures. The small pictures get lost, and the eye, in looking at the large one, gets distracted. We have commented thus on these, may be, too familiar things, in the hope of lessening apparent difficulties here and there; for a thoroughly well-placed picture in a room in harmony with it is surely still, after all efforts, a *desideratum*. We have said nothing of "decorative" pictures, as such may be termed, when they form an integral part of the wall of a noble room. When will the time come when this may be done, and examples of it pointed to?

GLEANINGS FROM THE TRADE UNIONS CONGRESS.

The eighth annual National Trade Unions Congress commenced its sittings at the Assembly Rooms, Crown-street, Glasgow, on Monday, the 11th inst. We glean the following items from the proceedings of this workmen's Parliament:—

Compensation to Workmen for Accidents.—Mr. Evans proposed,—

"That this Congress expresses its determination to do all in its power to get a measure passed through Parliament during next session by which employers should be made liable to pay compensation to their workmen for loss sustained by such workmen because of accidents occurring in the discharge of their duties through the neglect of those for whom their employers ought to be responsible, and that when such accidents are fatal, the employers shall compensate the families of the workmen so killed."

In supporting the resolution, he remarked that they would have some difficulty in getting such a Bill passed through Parliament on account of the peculiar composition of the House of Commons. That House was at present composed chiefly of those who were either themselves manufacturing employers or the directors of companies which largely employed workmen, and whose future profits and future conduct would be materially affected by the passing of such a measure. Railway servants were, perhaps, more than any other class in the country interested in this question of compensation. In a Blue Book of 1874 it was set forth that of the 270,000 railway servants in the United Kingdom, over 800 had been killed and over 1,500 seriously injured. Mr. Allan (Sheffield) seconded the motion. Mr. Banks (Boston) said that he had been requested by the Agricultural Labourers' Union to ask the Congress to press the necessity of such a Bill, because from their occupation they also, as well as members of the mechanical trades, were subjected to great risks in their work. The motion was unanimously carried.

The "Sweating" System.—Mr. Wright (Glasgow) moved the following resolution, which was adopted:—

"That, in the opinion of the delegates at this Congress assembled, the system in the tailoring and other trades known as the 'sweating' system—viz., the giving out of work to be made in the homes of the working people—is injurious to the best interests of the trade and the community, morally, socially, and financially, because it tends to demoralise those so employed, by inducing them to resort to stimulants to excite their flagging energies; because it spreads contagious disease, as in almost all cases the homes where such work is completed are, from the poverty of the occupants, the nurseries where the patients are treated; and it leads in all cases to reduce wages, and ultimately to cast those engaged on the support of the parish, and thus swell the amount of pauperism. We therefore pledge ourselves to use all our influence to suppress this system, and to bring the names of out-workers under the surveillance of the Inspectors of Workshops."

The Labour of Women.—Miss E. Simcox, London, read a paper on the subject of the organisation of the labour of women, which she believed to be an essential part of the labour question. The skilled labour of women could occasionally be procured at one-third and one-half less than the skilled labour of men, and consequently employers had a stock of people to draw upon in the case of a dispute. The result of this was that some unionists might propose to exclude women by force, as at Kidderminster, but this was an expensive and unsatisfactory plan. Speaking for herself, she would have all women refuse to do men's work for anything less than men's wages; because their doing so tended to substitute an unnatural law of competition prices; and she believed if women were made aware that their accepting small wages lowered the rate of pay all round, they would cease doing so at once, as they would find greater advantage resulting from combination than hostility. The object which the promoters of female unions had in view was the raising the rate of wages for skilled female labour to its cost price. If they could only establish a minimum rate, the maximum wages would rise, and women would have no temptation to enter the same trades as men, except on the same terms, in which case the employers would have no inducement to engage them; and then the absurd practice of females underselling their fathers, husbands, and brothers would cease. The low price of female labour made it absolutely impossible for many of them to live honestly. If they could only raise the wages of women to a rate at which the poorest could live decently, many evils would cease of themselves. Permanent organisations would be an advantage to the class, for no woman could tell whether she would have to work for wages all her life or not. At present the rate of pay even for good work was so small that it was hardly worth the employer's while to try to distinguish between competent and incompetent hands. Mr. Shipton, London, proposed the following motion, which was adopted,—"That the members of this Congress regard with much satisfaction the development of the self-helping and self-relying Trade Union movement among women employed in the various industries, and pledge themselves to assist in promoting it in their respective localities." A vote of thanks was also given to Miss Simcox for her paper.

Workmen and the Patent Laws.—Mr Prior, Sheffield, proposed,—"That the Patent Laws of this country require immediate and thorough reform in the interest of our national industries,—especially so as to do justice to the numerous inventors among the working classes, by enabling them to secure to themselves the benefits of their inventions, which the present high scale of charges and the complicated system of the patent law practically prohibits, and that it be an instruction of the Parliamentary Committee to do everything in in its power to bring in a Bill embodying this reform." The resolution was unanimously adopted.

The Regulation of Workshops.—Mr. J. G. Allan (of London) proposed the following resolution:—"That this Congress, feeling the vital importance of simplifyng, consolidating, and extending the Factory and Workshops Acts, 1833 to 1874, to all children, young persons, and women employed in workshops, and shops for the manufacture, sale, and repair of goods; and also of enacting such regulations as shall lead to the proper registration and sanitary improvement of such establishments, in addition to the appointment of a sufficiently qualified staff of inspectors to carry out the provisions of the aforesaid Acts, hereby expresses its firm determination to strain every nerve with the object of attaining the same during the next session of Parliament, and earnestly calls upon every trade society in the kingdom to give the Congress their hearty support." Mr. M'Allan, vice-president of the Congress, seconded the adoption of the resolution. Mr. Self (of London) supported it, and spoke of the want of the enforcement of the Acts in the printing-offices in London. The offices, he said, were in some cases simply abominable, and not fit for savages to operate in. Mr. Allan's motion was adopted.

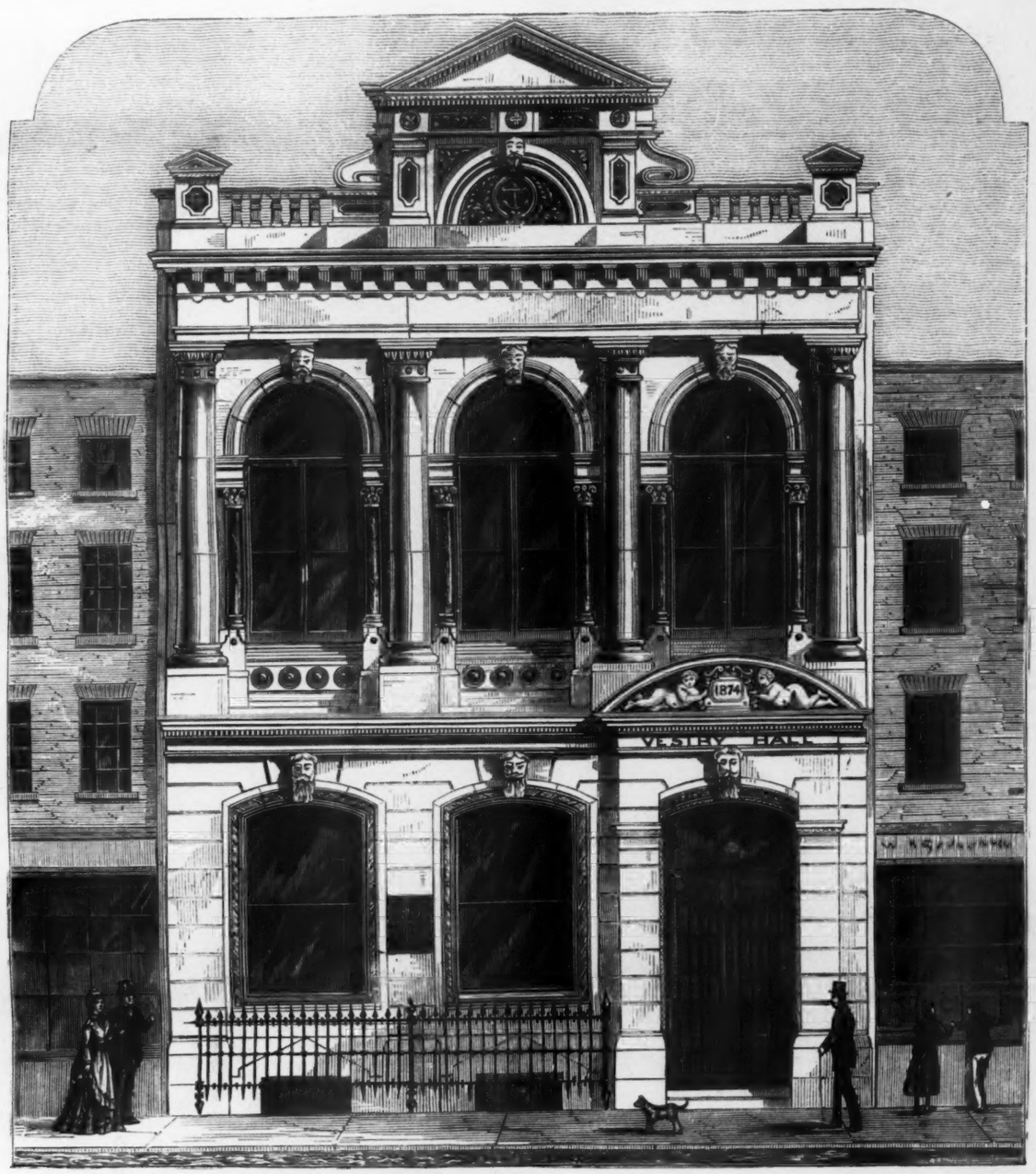
Union of Painters.—The operative painters of Glasgow, on the recommendation of Messrs. Shipton (London) and Slatter (Manchester) have agreed to open up a communication with the Manchester Alliance of House Painters, with the view of forming a union with that society.

The Congress will be held next year in Newcastle.

BRICKMAKING.

Can any of your numerous readers suggest a remedy to prevent red facing bricks turning partly white when fully burnt?

J. L.



NEW VESTRY HALL FOR THE PARISH OF ST. CLEMENT DANES, LONDON.

Messrs. F. Cadogan & J. Butler, Architects.

THE NEW VESTRY HALL, ST. CLEMENT DANES, STRAND.

Our engraving represents the entrance-front of the new Vestry Hall, which has been erected in Clement's Inn Passage, from the design of Messrs. F. Cadogan & J. Butler, architects. Mr. Thorn was the builder.

The former Vestry House, situated in Picket-street, Strand, vested in the churchwardens in trust for this parish, having been taken in the year 1871 of Mr. John Smith and Mr. Daniel Betts, the churchwardens for the time being, by the Commissioners of Her Majesty's Works and Public Buildings under the provisions of the Courts of Justice Concentration (additional site) Acts, this freehold site was purchased in 1874 by the then churchwardens, Mr. Thomas Parker and Mr. Robert John Dobree, and the present structure was erected upon it, and is about to be opened for the use of the Vestry and parishioners. Mr. John Neale and Mr. James Hodges are the present churchwardens; and the Rev. Robert James Simpson, M.A., is the rector. The amount of the contract was 4,600*l.*, and about 1,500*l.* have been spent since. The sum received for the old Vestry House was 10,000*l.*

COMPETITIONS.

The Proposed Municipal Buildings at Newbury. Mr. J. S. Dodd, the author of the design "Berkshire" submitted in this competition, writes as follows to the *Reading Mercury* of the 23rd inst.:—

"A short time since an advertisement appeared in the *Mercury*, inviting designs for the proposed new Municipal Buildings, Newbury. I and other architects responded, and forwarded drawings for the same, with a joint request that a professional man should be called in to adjudicate. Our request was granted, and Mr. Morris reported on the drawings. A copy of the report was sent to the different competitors, and we were requested to forward additional drawings. It seems that one architect did not adhere to the instructions furnished, and Mr. Morris very properly disqualified him. It appears, however, this gentleman was allowed to compete again, and that his design was selected for adoption. In common fairness, I may ask, why such an unusual proceeding was permitted, and whether such a course does not favour the idea that the competitors were asked to forward additional drawings to give the gentleman whose first design was rejected another opportunity?"

Weston-super-Mare Parish Church.—The plans and designs of Mr. E. Tuck, of Bath, have been accepted in the public competition for the re-lighting of the Weston-super-Mare parish church.

THE CHOIR-STALLS, EXETER CATHEDRAL.

The new choir-stalls in Exeter Cathedral, which have recently been completed, are from the designs of Sir Gilbert Scott, and have been made and fixed by Messrs. Farmer & Brindley. The work, owing to its elaborate nature, has necessarily occupied much time. The stalls extend for three bays eastward from the choir-screen on the north side, and rather less on the south, owing to the space occupied by the bishop's throne. There are five returned stalls at the west on each side, and, below the stalls, two rows of seats for the choir, which are divided by the gangways into four blocks on each side. The canopies are of elaborate workmanship, with curved projecting fronts and a great deal of enrichment of Early Decorated style. Shades are provided to the end stalls with carved pattern of roses, pomegranates, &c. There are no panels to the backs of the stalls, but an open stone screen, the arches of which are concentric with those of the canopies.

THE NEW CHOIR STALLS, EXETER CATHEDRAL.—Sir Gilbert Scott, R.A., Architect.

LANCING COLLEGE CHAPEL.

DEDICATION OF THE CHAPEL IN THE CRYPT.

The dedication of this chapel took place on the 26th inst. It will be remembered by many that in July, 1868, the corner-stone was laid by the late Bishop of Chichester, with great ceremony. Since then, the works have steadily but slowly progressed, but had not an unforeseen difficulty arisen, there would have been now much more than 25 ft. of the walls above the ground. The difficulty was, that the rock of chalk on which the college stands was found to suddenly dip down perpendicularly just at the west end of the chapel, to a depth of from 40 ft. to 60 ft. below the ground. The upper strata, composed of clay and loam, doubtless the ancient top soil of the Downs, washed down into the hollows of the chalk, was found not sufficiently stable to bear the weight of a building nearly 150 ft. high. It was, therefore, determined to sink down to the chalk, and it became a matter of very serious importance to construct the foundations in the firmest, and also in the most economical manner,—therefore, instead of putting in continuous foundation-walls, it was arranged to carry down to the rock-chalk a series of great piers of concrete under each buttress and arcade pier, and to arch between them, just under ground, to support the aisle and apse walls. Excepting some of the ante-chapel piers, they are now completed, and are from 40 ft. to 70 ft. deep, with superficial areas of from 40 ft. to 150 ft. On these foundations the walls are raised from 18 ft. to 25 ft. The extreme inside length of the chapel is 168 ft., with an ante-chapel 40 ft. long in addition. The whole width inside, including the aisles, is 63 ft., the width of the choir itself is 30 ft.; there are ten bays, with a five-sided apse to the chapel, and two bays to the ante-chapel, which return as transepts.

The height to which the walls are now built brings them up to the level of the quadrangle, or the top of the hill slope at the west end; there is thus a large space to be utilised at the east end, or bottom of the slope, which although it cannot be lighted on the south, or quadrangle side, yet can be well lighted on the north and east. It was, therefore, decided, to construct this portion of the building as a crypt, or lower chapel, to be used while the great chapel above is being completed.

This lower chapel in the crypt is 93 ft. 6 in. long and 63 ft. wide; it is divided into four aisles by a row of small columns in the centre, and by the two rows of the great piers under the arcade above. The aisles are carried as far eastward as the commencement of the great apse, and the last bay of each, which will be carried up as a tower, does not open into the central space, but is made apsidal inside and forms a separate chapel. The whole space is groined at a height of 17 ft. from the floor, excepting in the apse, where there is formed an octagonal dome under the upper altar-platform rising to the height of 25 ft., and in the chapels the pointed barrel-vaults are 22 ft. high; the ribs of the groining and the arches are in Scaimes-hill sandstone; the filling in is of chalk in courses, with bands of grey chalk in the dome and eastern bays.

The outer walls are 5 ft. 9 in. and 4 ft. 4 in. thick above the plinth; the outer thickness is faced with sandstone ashlar, the inner thickness with chalk. The great arcade piers are built to a height of 7 ft. in brick and cement octagons, 4 ft. 10 in. diam.; on each rests a Portland stone landing or abacus, 12 in. thick, projecting all round 1 ft. for the purpose of carrying the stone arches and groining ribs, behind which rises the solid brick octagon to the upper chapel floor; the brick pier under the abacus is faced with chalk.

The central row of columns is of solid sandstone. The altar stands in the apse raised above the general level. The chapel at the east end of the south aisle is the "founder's (Canon Woodard's) chapel"; it is two bays long including the apsidal bay in which is the altar-platform; this chapel will be separated by stone traceried screens in the arches from the larger chapel. Under the south wall, and 15 ft. southward, is the founder's vault. On the north side is a chapel which may be used for missionary purposes.

Each bay of the apse and north aisle is lighted by a cusped lancet, 2 ft. 6 in. wide; this aisle will be continued westwards and will rise by broad flights of steps into the ante-chapel. The western portion of the crypt is separated from the other by a screen-wall, and is being constructed with plain brick arches and piers and concrete vaults to carry the floor above.

The walls of the upper chapel are now steadily progressing; the double plinth, 6 ft. 6 in. high, is already fixed along the whole length of the south side and round the apse; and the ashlar work and aisle windows are being prepared. The outer and inner facing is of sandstone. The works are being carried on by workmen employed by the college from the designs of the architect, Mr. R. Herbert Carpenter.

TO WHAT CAUSES ARE TO BE ATTRIBUTED THE WANT OF SANITARY PROVISIONS IN THE DWELLINGS OF THE UPPER AND MIDDLE CLASSES,

*And What is the Best Method which should be adopted to Remedy and Rectify the Same?**

I have repeatedly examined houses, the rentals of which would not be less than 600*l.* per annum, in the most aristocratic portions of the metropolis, and have found sanitary defects equal and on a par with those I have before referred to.

Only a short time since I discovered, in three separate instances, under the basement of houses, disused cesspools filled more or less with excrement, emitting a disgusting odour and covered with loose or rotten boarding; the old brick drains had simply been cut off from the sewer and left as they had been originally laid in.

Upon surveying one house for a client of mine, preparatory to making an offer for its purchase, I noticed the peculiar odour of sewer gas. It had been unoccupied for some months; its care-keepers had evidently from habit lost the use of their olfactory organs. Upon making inquiries I discovered that after living in it for six months the last inmate had given up the lease. No cause was assigned. An investigation of the parish maps showed that at a short distance from the house one of the main sewers terminated, across which a dead wall had been built. A ventilating-pipe from the house had been connected with this sewer, and was conducting the sewer gas congregated at its head into the same.

I narrate one other instance as an illustration how persuasion, when combined with interest, may exercise an influence where force fails. A client being desirous of purchasing two semi-detached houses, situated in a good and rising neighbourhood, instructed me to report on their value and sanitary condition. Accordingly I attended and commenced my survey, accompanied by the builder, to whom, from time to time, I put a few leading questions. Shutting up my note-book on the conclusion of my survey, the builder addressed me thus:—"Ah, sir," said he, "your client will not buy these houses; I know how you are going to report." "Well, my friend," I replied, "you know more than I do, then. There are certain matters which will have to be attended to; but I am sure you will do these rather than lose the sale of the houses"; and I explained to him *what* I considered necessary, and *why*. "Well, sir," said he, "you are right, and not unreasonable; a good many of the things you mention I did to the first two houses I built, but I found it no use. I could not get any return for the money expended. The public did not appreciate them. I asked for those houses a little extra rent to recoup the outlay, but the applicants said that they could get the houses over the way at a less rent, and I was obliged to let them; so, sir, I built these and the others as cheaply as I consistently could, and omitted these improvements." "Well," I rejoined, "consent to these alterations, and I will agree on behalf of my client to pay half the cost." He did so; I purchased the houses, and I am happy to state that the result of my arguments has been to induce him to introduce the same arrangements in the houses now being built by him in the same locality, and he tells me that he has not regretted adopting them, either morally or financially.

We will now consider definitely what are the sanitary defects which exist in most of our London structures? To render these clear to your comprehension, I have prepared diagrams to which I shall refer as I proceed.

As a general rule, the subsoil of the houses is not disturbed: the foundations are at once laid upon the virgin soil, but if the same consists of gravel or sand, then it is quickly excavated and sold, the void thus left being filled up with rubbish of the most improper description, the spongy character of which, combined with its putrescent nature, lays a sure "foundation" for future illness. Subsoils, as a general rule, are quite undrained, sometimes are saturated with impurities, and are seldom in healthy sanitary condition. The next important, and generally the most defective, arrangement is that of the drainage. The ordinary plan in a London house is to bring the main drain-pipe through the passage of the basement into the centre of the house, and to connect thereto the various branches from the water-closets, sinks, cisterns, &c. This system would be objectionable if properly carried out; as generally executed, it is absolutely dangerous. One generally unsuspected, and therefore more dangerous, peril, connected with the drainage of our town houses, is the existence of cesspools in the very centre of the dwellings. These are often very nearly filled with putrescent alvine matter, and are simply covered over with tiles, stones, or boarding, which in the course of time have become rotten or decayed. Connected with these cesspools, we find old brick drainage still left under the houses, forming admirable runs for rats and vermin, and receptacles for the storage of noxious gases. This state of things, as I have before referred to, I have found in my own practice, existing in what are called first-class houses, situated in well-known streets, and inhabited by wealthy and even aristocratic denizens. As corroborative testimony, I quote Dr. Whitmore's observations in his last report to the Marylebone Vestry:—"Many of the best houses in the parish situated in aristocratic streets have brick drains thirty or forty years old, and most of them very defective." How is this to be accounted for? The sewers of London were originally intended for surface purposes; indeed, up to about the year 1847 it was a penal offence to connect soil-drains with the same. In the year 1844 a report of the Commissioners appointed to inquire into the health and state of towns was published, and to their recommendations may be attributed most of the improvements in drainage works, and most of the legislative enactments which have since taken place. About this time, and notably with the advent of the Metropolis Local Management Act, 1855, it became compulsory to connect house-drains with the sewers, and to close up cesspools, sanitary science being little understood, and less appreciated. Avoidance of expense was the first consideration, and instead of eradicating the defects once and for all, the cesspits were left in, and the old brick drains either connected with the sewers, or left in without the precaution, oftentimes, of even stopping their ends. Even when pipe-drains are used, with joints fairly cemented round, they are scarcely ever properly laid. Their gradient is invariably too little, and the consequence is that they soon become silted up, the pressure of the sewage causing the joints to leak, and the saturation of the soil with general escape of insalubrious vapour to the interior of the house.

The undrained subsoil, improper foundation, and defective drainage, naturally render the basement of the house totally unfit for habitation. As a general rule, the walls are thin, built of porous bricks, without impermeable material to act as damp-courses. The boarding is ordinarily laid without tongues or other precaution to keep back the noxious exhalations which at varying alternations of temperature, rise from the sodden earth, and permeate through the superstructure. In truth, the houses constructed for the dwellings of the upper and middle classes are but as receivers over a still below them, in which impurities and gases are distilled over, being collected and condensed above.

The position of the kitchen range, fireplaces, sinks, and cisterns, combined with their connexion with the system of drainage, assists in pumping out the impure atmosphere, disseminating it through the new premises. The basement passages and staircases are nearly always unventilated, dark conduits, forming channels for the diffusion of the soiled air into the ground or principal floor of the house, whence it is guided into the space occupied by the principal and back staircases. Sometimes these staircases are lighted from lantern or head-lights (and which, by the way, are not always constructed to open, and if so constructed are seldom taken advantage of); generally they are ceiled at the level of the best bedroom floor, and have a room or rooms carried over the same. Staircases of most London houses are inadequately lighted (scarcely ever ventilated) from the small yards

* By Mr. H. H. Collins. Read at the Brighton Congress. See p. 926, *ante*.

which are left in the rear of the houses, such yards often forming themselves shafts for the collection of impure air, which is conveyed therefrom into the bedroom floors. From off the landings of these staircases, water-closets, housemaids' closet, &c., are contrived, which contribute by their defective arrangements to further poison the air, and to lead it to the bedroom accommodation of the house.

A favourite arrangement of some of the best and most expensive houses of the metropolis is to place the water-closet in the centre of the house, ventilating the same into the principal staircases (and sometimes, but not often, carrying up a shaft to the roof): this brings the noxious gases thoroughly well into and up to the bedroom floors of the house; by this plan the soil-pipe is also carried through the centre of the premises, and its position can generally be discovered either from the discolorisation of the paper or paint, or from the mephitic odour given off. The staircase, which should act as the ventilator of the house, indeed, as its lung, is made the vehicle of contagion, all the impurities of the house discharging themselves into it. These water-closets are usually planted opposite the best bedroom, and are generally in conjunction with a small housemaid's sink, contrived under the stairs, the waste from which is carefully carried into the soil-pipe of the closet; probably, taken all in all, no better system could well be devisedfor carefully introducing into the house, and retaining therein, any sewer gas which may arise from the choked drains or covered cesspits in the basement. Our coal gas is not half as well laid on as our sewer gas: the smallest leakage of the one is easily detected, and as facilely rectified, and thus danger can be quickly and happily avoided; but with the other the whereabouts of a slight aperture or a minute perforation is most difficult of discovery, and is usually expensive and laborious to rectify; the danger is rampant, and cannot be subdued before the injury has been thoroughly effected. Cupboards for soiled linen, and other impure matter, are generally found under spandrels of stairs, and, being unventilated, contribute their quota to the infection of the air, and by their position promote its distribution. No more considered as a luxury, but assuming its proper position in every well-appointed house, either of the middle or upper classes, is a bath-room; few greater conveniences are rendered more dangerous nuisances by position and construction than these modern appliances. The bath-room is generally located in some small room adjacent to or in connexion with a bedroom or bedrooms, oftentimes without any fireplace or ventilation, and sometimes with only a borrowed light.

The supply-pipes for hot water are generally connected in good houses with a boiler of the kitchen range, and are conveyed to the bath through the house up a chase left in the wall, which contains also the soil-pipe of the water-closet apparatus. These soil-pipes are sometimes of lead, and often of iron, plain or galvanised. The bath, usually of thin iron, zinc, or copper, seldom properly supported or cradled, has the waste therefrom connected with the soil-pipe, sometimes with the trap of the water-closet, or with an independent trap. Under the bath, to prevent overflow to the rooms below, is placed a zinc safe, which again is supplied with a small orifice leading into the before-mentioned soil-pipe. This arrangement is again most prejudicial in a constructive and sanitary point of view. Constructionally, it is wanting in economy. The hot-water pipe causes a contraction and expansion of the joints of the pipe, creating leakage and decay. Sanitarily, it produces defects which permit of entrance to the house of impure air, and by suction draws it into the bed and other rooms. The overflow and waste frequently become untrapped, and in certain conditions the flow of water from the bath waste enters the trap of the water-closet.

The position of the cisterns next claims our attention. Generally speaking, they will be found located in the most out-of-the-way and inaccessible parts of the house, and consequently from this cause alone become neglected and unclean, the water being fouled by sedimentary sludge and feculent matter, which quickly accumulates therein. In the basements they are usually situated in the vaults and over the scullery sinks, the scullery itself being a narrow ill-ventilated slip, inadequately proportioned for its work. The waste-pipe from the cistern is usually carried into the drain, where it is supposed to be trapped. The result of the arrangement is this, that as regards the waste it conducts the sewer gas into the water, where it is absorbed; that the impure air proceeding from the sink, with its generally defective overflow, is also imbibed by the water in the cistern; and that a similar process goes on from the supply of the servants' water-closet, which is also generally connected therewith. When you consider that the whole of the potable water of the establishment is usually drawn from this supply you cannot wonder at the lethal effects which are produced. In the upper portion of the house, more often than not, the cistern is placed in the roof, sometimes on the roof, in connexion with the ventilating pipes or closets (if any be provided), fully exposed to all the contaminating influences of the dirt and filth which congregate there; the wastes and water-closet apparatuses are connected therewith, as just mentioned, and with the same lamentable results.

The facts above enumerated are perhaps the most salient sanitary defects of the internal arrangements of the houses of the middle and upper classes, although many other imperfections might easily, if time permitted, be animadverted on, such as position and plan of landing, want of ventilation, not only of drains and conveniences, but of houses generally, method of heating, and carelessness as to disposition and aspect of rooms with regard to the purposes they are destined to fulfil.

Now, how are these defects to be remedied and prevented?

1. We require additional compulsory, not permissive, sanitary enactments,—the Building Act should be revised, so as to confer greater authority on and larger powers to the district surveyor, and local authorities should be amenable to a central board to carry out with strictness the provisions of the Acts of Parliament.

2. The clauses of the present Acts should be carefully utilised, and not rendered inoperative by the perfunctory manner in which their obligations are construed, amounting to avoidance thereof.

3. It should be imperative that vestries or local authorities should appoint well-qualified and well-paid officers to interpret and to carry into effect the laws relating to the health of the people; men whose professional attainments, scientific knowledge, and social position will command respect and insure obedience; men who have the *fortiter in re* to insist, and the *suaviter in modo* to persuade. *Vide* the success attending Mr. Arntz's efforts. The best prevention, however, will be by educating the people to a sense of their own danger and ignorance; we shall never succeed in making them wise, cleanly, temperate, or pious by Act of Parliament. If we cannot appeal to their higher and better qualities, we must address ourselves to their lower and meaner natures,—we must indisputably prove to them how their individual interest and welfare are combined with a due regard to sanitary precautions. If once it becomes an acknowledged fact that people will not inhabit houses deficient in the essentials of life,—fit air to breathe, fit water to drink, fit drainage for health,—depend upon it houses will be erected with due regard to sanitary considerations, unsanitary houses will be altered and their defects rectified,—the supply will soon equal the demand. Mammon will become good friends with Hygeia, and people will soon learn,—

> "That something there is more needful than expense,
> And something previous to taste, 'tis sense."

The points to be observed, and the precautions to be adopted, in building healthy urban dwellings, happily need no great amount of intelligence for their comprehension, require no scientific skill for their procuration, and involve no large expenditure in their execution; they are but few, simple in the extreme, and only accord with common-sense observation.

Old houses mended cost little less than new before they are ended, and by attention to the following suggestions, laid down with no dogmatic intent, the lives of both old and new houses, together with their inmates, may be prolonged and preserved structurally and sanitarily to their natural term of existence.

All subsoil should be properly drained, proper thickness of concrete should be applied to foundations, damp-proof courses should be inserted over footings. Earth should be kept back from walls by dry areas, properly drained and ventilated external walls should be built of good, hard, well-burnt stock brickwork of gradnated thicknesses, and never less than 1 ft. 2 in. thick. Internal divisions should be of brick, in cement. The mortar or cement should be of good quality.

All basement floors should have a concrete or cement bottom, with air flowing under the same, and the boarding thereof should be tongued so as to prevent draught and exhalation penetrating through the joints of the same.

Ample areas back and front should be insisted on, the divisional or party fence walls of which should never be allowed to exceed 7 ft. in height to allow free circulation, and to prevent the areas becoming wells or shafts for stagnant air.

The main drains should be carried through the back yards; and, to prevent inconvenience to adjoining owners from any obstruction, they should be laid in subways, so that the sewer-inspectors could gain ready access thereto, without entering any of the premises, or causing any annoyance to the tenants. No basement should on any account be allowed to be constructed at such a level as will not permit of the pipes having good steep gradients to the sewer.

All pipes should be of glazed earthenware, having joints made in Portland cement, and resting on good solid foundations.

The connexion with the sewer should be direct, merely inserted in the eye with a hanging flap. It is a moot question as to the insertion of a syphon between the house-drain and the sewer. I have always found this to silt up, and to become a nuisance, and of later years I have discarded it. If used, it would be well to ventilate it. All main drains should be ventilated in proportion to their area and length by lead ventilating-pipes carried up to ridges of roofs. Special care should be taken to prevent any direct connexion from the house with the main drains. All sinks should be placed next external walls, having windows over the same, and removed from the influence of the fire-grates. All wastes should discharge exteriorly over, *not into*, trapped cesspits, as illustrated by diagram having splashing stones fixed round the same. These cesspits require care in their construction. Syphon-traps and bell-traps are to be avoided wherever possible; they often cause the very injury they are intended to prevent. Care must be taken to turn eyes in brickwork wherever pipes pass through walls, to prevent joints breaking. The scullery-sink should have a special fat-trap provided, or one of Field's patent self-acting flush-traps, which I have used with great success. The basement cisternage should be placed in a convenient and accessible position, protected from dirt, and guarded from the effects of alternations of temperature. They should be of slate or galvanised iron, and never of lead or zinc. They should be fitted with overflows, discharging over the sink or over trapped cesses, as just mentioned. They should be supplied with stout lead-encased block-tin pipe. The services therefrom for all drinking-purposes should be of the same description, and should be attached to an ascending filter, so that the water may be delivered free from lead or organic impurities. Lead-poisoning is more frequent than is generally believed; but readers of the *Sanitary Record* and other scientific journals find from time to time numerous records of its danger. Dr. Alfred Hill, the borough analyst for Birmingham, states that "it is a cumulative poison—it remains stored in the system to manifest its effects at some future period." Dr. Muspratt writes that "the source of slow lead-poisoning is almost invariably found to be the water employed for domestic purposes, the lengthened use of which causes depression of spirits, emaciation, cholic, and paralysis." Our chairman, Dr. Richardson, also stated his opinion that contamination of water by lead is the cause or source of various obscure diseases. The servants' water-closets, of which there should always be two, for the accommodation of each sex, should be placed in an open, well-lighted, and well-ventilated position. It is a false idea of decency which dictates locating them in out-of-the-way positions—out of sight out of mind; precisely because they are used by the least careful portion of the household should they be open to inspection, if we wish to insure their salubrity. The cisterns should be distinct in position, and supply from the store or drinking-water cistern; the wastes thereof should turn out over cesspits, and the closets should have good earthenware hoppers, with flushing rims, syphon-traps, and pull-down chain.

Cupboards under stairs, under sinks, under dressers, or in out-of-the-way places, should be avoided, and when fitted up should always be well ventilated. All passages should be well lighted and ventilated. Borrowed lights are better than not having any other. Every room should be furnished with a fireplace, and Comyn & Ching's ventilators over doors and windows

should be freely disposed. It would conduce to the health of the house, without adding 1s. to its cost, to build next the kitchen flue a separate ventilating flue, and to conduct the products of combustion from gas and other impure or soiled air, &c., into the same from ventilators placed in the centre of or close to the ceilings as may be found most convenient. By carefully proportioning the inlet and outlet ventilators, the air will be kept moving without draught, and preserved in a pure and sweet condition for respiration. The windows and doors will then serve only their legitimate objects of admitting light and affording egress and ingress to the various apartments. The staircase should be made the main ventilator of the house, and it is essentially necessary to preserve the air surrounding the same uncontaminated, pure, and undefiled. It will be better to light and ventilate it from the top; and to prevent the Ethiopians or blacks of London finding their way into the house, an invisible gauze net may be placed under it, which can periodically be easily removed and cleansed, or to furnish it with a movable, inner, ornamental flat light.

The water-closets, both on the ground of sanitary considerations and constructional economy, should be placed over each other, out of the house, and separated therefrom by necks or lobbies, lighted and ventilated each side by windows extending to the ceilings; these passages should be enclosed by glass screens, and may be made very ornamental features; these lobbies can be fitted up with closets, or as ferneries, or to suit the exigencies or taste of the occupants. The water-closets should be of valve construction, the soil-pipes should be of block-tin cased pipes, and should be ventilated by being carried up well over roofs, and left with hoods or cowls open to the atmosphere. If safes be introduced under the same, the overflows therefrom should be carried through the walls, and furnished at feet with ground brass flaps to prevent any back draught. The water-closets' fittings should be constructed to remove, the risers being hung as doors so as to admit of ready inspection and cleansing. There should be an air grating fixed between the seat and floor to prevent impure air lodging there. All closets should have india-rubber bands between seat and basins to prevent draughts penetrating, —a source of danger productive of illness.

The form of water-closet apparatus always to be avoided is that known as the pan-closet. It is a closet most favoured by the public, because the cheapest in its first cost. It consists of a large chamber called a container, which is made of iron; on this is fixed a movable pan, into which dips the basin. The container is connected with a D trap, which is attached to the soil-pipe leading into the drain. The service-pipe communicates with the cistern either through the medium of valves or service-boxes, as I have illustrated, and by either elevating or depressing these, the water is allowed to flow through the fan of the closet, where it is dispersed round the basin, and, when soiled, is carried away through the pan-container trap and soil-pipe to the drain, washing all before it, and leaving a certain quantity of clean water in the trap and pan of the closet to seal or trap the same. Now you will perceive the cumbersome container is simply provided to enable the pan of the closet to be opened or shut; the excrement descends into it, and in progress of a very short time coats its ample surface with fœcal matter. The container soon becomes honeycombed, and the usual practice of plumbers, in order to cleanse the same, is to burn it out, and thus to roughen and to destroy its surface altogether, the excrement putrefying and causing a continual distillation of gas, which, when the supply-pipe is empty, ascends to the cistern, and is absorbed by the water therein; it also finds its way to the house every time the closet is used; and if the same be unused for any length of time, it is absorbed by the water in the pan, and thus given off into the house. When the soil-pipe is unventilated, it also enables the sewer-gas to penetrate into the premises. No amount of ventilation of the soil-pipe will prevent this, if this form of closet be adopted.

The chamber in which the water-closet apparatus is placed should be well lighted and ventilated top and bottom by ventilators, as before described. A separate cistern should be provided to supply these closets with a good head of water, and at least 1¼-in. pipes, to ensure ample flush. My own experience is adverse to the employment, if it can be avoided, of the small cisterns called water-waste preventers. The cisterns must be furnished with overflows discharging into the open air, and, together with their supplies and services, so positioned and protected that the water shall not be frozen; that they shall be easy of access for cleansing and examination; and be well ventilated, so that the water does not become stagnant or impure. It is advantageous to place the hot-water cistern in the same cistern-chamber, but so far removed as to preserve the coldness and freshness of the liquid. Stopcocks should be supplied to each service and supply, so that in the event of repairs being necessary, the stored water is not wasted.

If lavatories or sinks are employed, they must be used as above mentioned for the W.C. apparatus. Under no circumstances, however, must they be brought in connexion with the drains. Most people desire the bath-room to be in proximity to the bedrooms. Whether so positioned or not, all connexion with the main drainage must be studiously avoided. The hot and cold pipes known as the flow and return pipes should be of galvanised iron, with junctions carefully made with running joints in red lead. On no account should these be in contact with any other pipes. The wastes from the bath safe under (and lavatories if any) should be carried through the front wall of the house, and should turn over and into rainwater-heads, covered with domical wire gratings, to prevent birds building their nests therein, and carried down to the basement area, where they must discharge over a trapped cesspit, as before described, surrounded with a splash-stone or curb, to obviate the nuisance of the soapsuds flowing over the pavement. A brush passed up and down these wastes now and then will effectually remove any soapy sediment which may cling to their surface. The waste from bath, &c., into heads should be furnished with a ground valve flap and collar, to prevent draught, and the bath should be fitted with india-rubber seatings between the metal and wood framing, for reasons before adverted to. Mansard or sloping roofs should be avoided. They are injurious to the health of the domestics, whose sleeping-chambers they are generally appropriated for. They are unhealthily hot in summer, and prejudicially cold in winter, laying the basis of future disease for those least able to bear it. Gutters taken through roofs, known as "trough-gutters," should never be permitted; they congregate putrescent filth, which remains in them for years, to taint and poison the atmosphere.

These simple precautions, so easy of accomplishment at so trivial an expenditure of either study or money, are a *resumé* of what could and should be insisted on in the erection of every structure intended for residential habitation.

I have now as succinctly as possible epitomised the causes which have induced and to which I attribute the unsanitary condition of the so-called houses of the upper and middle classes. I have sketched some of the effects which are produced by the systematic neglect of judicious planning, judicious hygienic precautions, and ill-construction of our dwellings, and I have endeavoured to shadow forth how cause and effect may be rectified or ameliorated, if not effectually prevented. The ignorance which would neglect the accumulated wisdom and experience of years becomes culpable folly. Year by year we offer up our tribute to the devouring Minotaur of disease, sacrificing hecatombs of victims to his insatiable maw,—the strength and flower of our population meekly and passively accepting as the Atropos of fate that which a determined effort could with facility destroy. "Let us look down and see what death is doing."

GENERAL FOREMAN AND CLERK OF WORKS.

Sir,—Before this discussion is entirely closed, will you allow me space to make a few remarks in reply to some of the statements put forth in opposition to the argument with which I opened the question? I will first confine my remarks to the second letter from your correspondent "E. L.," page 868.

To his statement that it is common for the architect to give in working drawings the fullest detail of the brickwork, and leave the joiner to use his own judgment, I beg to say it is in direct opposition to my lengthened experience. Why should it be otherwise, seeing that an architect can possess himself of any number of books illustrative and descriptive of joinery in its most minute detail, while I doubt if upon brickwork there is one in existence worth the name?

I decline the honour of the authorship of the absurd remark which he gratuitously attributes to me,—that it takes seven years for a joiner to learn part of his trade; for I, in common with all men, know that a learner, in whatever trade he works, gathers a part every year: how large a part depends upon his adaptability to learn. To his statement that a bricklayer learns his trade in two or three years, I reply that the skill brought to bear upon some so-called brickwork might be acquired even in less time; but my position in this discussion is assumed upon higher grounds; for it is a well-known fact that scarcely a tithe ever obtain the skill sufficient to master the higher grades of the work.

With regard to the mystery of joinery, I suppose it is like all other trades,—the more one becomes acquainted with it, the less mysterious it becomes. Moreover, a very large portion of this very mysterious business is executed by machinery. To the query, "What does a bricklayer know about it?" I reply, "What does a joiner know about brickwork?" Here is the very pith of my argument. Nor is it necessary for a bricklayer to be any further acquainted with joinery than in its connexion with the building; and, when it is brought there, to be fixed in the position already provided for it by the bricklayer. I repeat it is made in the shop, and no one will deny to the joiner his right to the leading position there. Again, the stability of the superstructure is beside the joiner's work, or the carpenter's. To the query, "What is the verdict of the architect?" I say, equally emphatic, that whenever a bricklayer proves his fitness for position, the architect as well as the contractor is ever ready to appreciate him: proof of this being shown in the fact that such a one finds no difficulty in obtaining an appointment, or in holding it; and I confidently assure "E. L." they are more numerous than he seems to be aware, or cares to acknowledge,— "and that is another fact."

To the statistics quoted from the science and art schools, I pay all respect; but they do not alter the premisses of my argument. They certainly show which branch is most anxious to distinguish itself; it is not at all surprising, seeing that the joiners hold it to be their mission,—that it is their own field, or Tom Tiddler's ground. But if the other branches were equally anxious, would not the chances of success be to them the same? And is not the preponderance of carpenter-prizemen owing to the absence of bricklayer and mason competitors? Again, while I acknowledge the commensurate value of the art-school teaching, I deny it is of itself sufficient. I repeat, the principal qualifications necessary to command success in the leading positions can only be acquired on the building, and there they must be displayed. The knowledge obtained in the art-school is but accessory, and can easily be acquired in a man's own home if he have but the will. See *Builder*, vol. xxiii., No. 1153,—a letter of encouragement to artisans,—the writer stating that his studies commenced with a pencil tied with string to one leg of a pair of iron compasses, and that the writer, without a half-hour's instruction from any man, fought his way to the leading position, and holds it still. Again, if the building trade were polled, how many of the numerous able leading men in either branch would be found to have passed in honours. I say the building has been their school, the degree of honour being the amount of confidence reposed in them by those that employ them.

Your correspondent, "C. W.," p. 825, suggests that the clerk of works should be a practical draughtsman and surveyor, with a practical knowledge of all the branches, &c. No doubt he would be a very useful man; but where is he to be found? and, if found, what need for him. Now, Sir, an architect is a practical draughtsman himself, and keeps a sufficient staff of such in his office, and does not delay making his plans until the building is commenced. What he wants in a clerk of works is as much proficiency in drawing as to enable him to carry out his instructions, not to usurp his position; he is also provided with a surveyor in the person of the quantity surveyor. As to the carving, decoration, strength of iron girders, ventilation, heating, &c., what architect would confide the responsibility of those matters to his clerk of works? His art-workmen are selected by himself, from their known ability, and he reserves to himself the prerogative of criticising their work. For the strength of iron girders, he seeks, if he needs it, the advice of the engineer, who makes these matters his especial study; the ventilation

and heating are entrusted to especial men, whose different systems are well understood and accepted by the architectural profession generally, the clerk of works being called upon merely, with his practical knowledge of the building branches, to assist in perfecting their arrangements.

"Country Mason" says, "Put the proper person in the proper place." That is just my argument. I say, put the brickwork in charge of a bricklayer; and as no one has yet denied my statement that brickwork holds the first place as a constructive material in the majority of modern buildings,—even in those stone-faced edifices that have been described as upholding the grandeur of the metropolis, for strip off the masonry, and the fact will still remain, the brickwork is the carcass, the stonework but one of its members,—so the bricklayer would, as a matter of course, hold the first claim to the leading position, provided always that he has made himself fit.

Again, it is a fact not to be denied, that, notwithstanding the extent to which brickwork is applied, there is no improvement, but rather deterioration, in the quality, while at the same time there is an increase in the cost; and while innumerable opportunities have offered themselves for the development of the capabilities of brickwork as an ornamentation, the best intentions of the architect have frequently been,—I can use no milder term,—murdered. I have, Sir, read in your columns the statement of "An Architect," that the reason why the profession generally did not use brickwork as ornamentation to the extent they would wish, was the difficulty in getting it executed, or the certainty of its being spoiled. Now, I venture to assert that this state of affairs has been brought about and perpetuated by the preference for joiners as clerks of works and general foremen, and the preponderance of joiner contractors, for it not unfrequently happens, on an important work, all three positions are held by the favoured branch. In conclusion, I beg to leave the subject, with these remarks, to the consideration of those most interested, trusting this discussion may be the means of awakening bricklayers generally to a sense of their true position, and incite them to turn to good account those educational advantages which are within the reach of all, whether it shall be art-school teaching or self-tuition; to use the knowledge thus acquired in the greater development of their experience in their own craft; and to improve their superior opportunities, and to acquire the necessary insight to the other branches of the trade generally, so that they may be able to enter, with good faith, into honourable competition with the joiner for the leading position, without fear of the result, even should they do no more than advance their present position with regard to the higher grades of their own work, so that it may be developed to the fullest extent of which it is capable. Then may I say my pen has not been used in vain.

To you, Sir, many thanks are due for the cheerful readiness with which you have opened your columns to the numerous correspondents who have contributed to this discussion, initiated by your humble servant in the fullest confidence, knowing that though my pen is feeble my cause is strong.

A Bricklayer Clerk of Works.

NEW CORN EXCHANGE, CAMBRIDGE.

The new Corn Exchange, which has been erected at the back of the Town Hall, in Wheeler-street, Cambridge, is to be opened on the 6th prox. The new Exchange is one of the largest of its kind in the country, the main hall being 163 ft. by 55 ft., and the transept 48 ft. by 30 ft. This form of plan was necessary from the awkward shape of the site. The building is in the Venetian-Gothic style, and is constructed with Cambridge bricks, relieved by red bricks from Woolpit, blue-black bricks from Staffordshire, terra-cotta from Stamford, and stone. The walls internally are fairly worked and pointed, the same as externally, so as to avoid plastering. The roof is in one span, formed by nine wrought-iron semicircular ribs. Upon these rest a lofty timber lantern. No slating has been put upon the roof, which has been covered with transparent sheet glass. The floor is entirely of wood, and provision has been made for heating the building by hot-water pipes. The chief entrance is in Wheeler-street, under a large archway and through a short entrance-hall. As the building may be used for public gatherings, all the doors are arranged to open outwards. The front portion of the building has been carried up much higher than was originally contemplated, for the purpose of providing an extra committee-room for the use of the Town Council, and above that is a complete residence for the custodian of the building. The architect is Mr. R. Reynolds Rowe, Cambridge; and the contractor, Mr. Elworthy, of Upwell.

GLASGOW INSTITUTE OF ARCHITECTS.

At the annual general meeting of this Institute, Mr. John Baird, I.A., the president, in the chair, a committee was appointed to consider and report upon a suitable memorial of Mr. Thomson.

Mr. Honeyman called attention to the announcement recently made by the Lord Dean of Guild to the effect that, in future, his court would undertake the supervision of new buildings. He quite agreed with the dean as to the disgraceful and, in fact, dangerous character of buildings being erected in Glasgow and its suburbs; but he strongly deprecated the assumption of increased powers by the Dean of Guild Court, which, as at present constituted, was utterly incompetent to deal with this undeniable evil. He thought it was high time that Glasgow had the benefit of a well-devised Building Act, and he gave notice of the following motion for next meeting, viz.:—"That a committee be appointed to consider the matter, and the best means of securing the co-operation of all parties interested." A meeting of the council was held immediately after the general meeting, when the following office-bearers were elected, viz.:—President, Mr. John Baird, 112, West Regent-street; Vice-President, Mr. Campbell Douglas, 266, St. Vincent-street; Treasurer, Mr. James Sellers, jun.; Secretary, Mr. William MacLean, 157, St. Vincent-street; auditor, Mr. James Salmon.

WORKMEN'S HALLS AND COLLIERS' HOMES.

The happy idea of transforming, where practicable, public-houses into "British workmen's" and kindred institutions has been attended with cheering results in the North of England. One of the most recent installations is that at Murton Colliery.

The Murton Hall is of the Norman style of architecture, and is 75 ft. by 40 ft., and the hall it contains is 56 ft. by 40 ft. A gallery is erected at the east end, with a platform at the opposite extremity. It contains committee-rooms, library, and reading-rooms. The cost of the building is but 1,300*l.*; but the proprietor of the colliery generously gave the stone and lead, all the materials, as well as added 50*l.* to the men's collection. The men, too, gave a helping hand. Mr. George Phalpas furnished the designs. This is not so bad for a little colliery, and which has opened its hall free from debt, and contrasts very favourably with workmen's clubs in London, that are indebted to wealthy individuals for their places of meeting.

At the opening of the Murton Hall, 900 sat down to tea, and at the meeting following, the speakers,—pitmen,—contrasted their condition with former times, and remarked, that though the working classes of this country had made great progress, there was a deal of lost time to make up. In olden times, if a man lost his work, or if he left his parish, unless he had a licence from the king, it was a crime, and it was no trifling matter to be a working man in those days. The working-classes need not, however, thank any one but themselves for the alteration made. If they turned round and saw the fine houses now being built for the miners of Durham, and contrasted them with the old, horrible hovels, where the boys got out at the top instead of the door, they would note the progress that had been made. This was, however, only a bill at maturity, and nothing else, and sanitary reformers would not stop there.

We might suppose from the above that the filthy and disgraceful hovels of the North are about giving place to what pitmen term "fine houses." A visit, some weeks since, however, to some of these "fine houses" did not afford any reason to endorse the colliers' praise, further than that the furniture in some must have cost more than the "fine house" that covered it. The still great evils are bad drainage, want of space, water, and decent closet accommodation. Fevers are bound to be to hand.

MAHOGANY IN JAMAICA.

The gradual destruction of the mahogany forests in Jamaica has been a loss both to that island in particular and the world at large. The mahogany grown there is naturally of a superior quality, and the ill-advised demolition of the trees, without making any provision for future wants,—a policy which has unfortunately been prevalent everywhere,—has deprived the trade of a good supply of wood, and the colony of a handsome revenue. The Government of the island are now taking up the question of restoring the forests; and though it will, of course, be many years before any benefit will be derived from the measure, it is a very wise one. In 1753 more than 500,000 ft. of mahogany were exported from the island. The export at the present time is very small.

WILLESDEN.

The first quarterly report of the medical officer of the new sanitary district of Willesden, now scarcely a year old, illustrates the neglected state of a fast-increasing suburb of London, in parts only about two miles from the Marble Arch. Being outside the metropolitan area, it has been allowed to grow up, as it were, of its own accord,—hence its unsanitary condition. The new local board are doubtless doing their best to remedy the defects, but it is always some time before a new board can get into working order, and therefore they are still, we believe, without any legal building regulations. It is much to be regretted that steps are not taken to obtain an Act of Parliament, applicable to the whole kingdom, to regulate the proper construction of houses for securing stability, the prevention of fires, and the purposes of health generally. Such an Act, so far as fires are concerned, was, we believe, recommended by a Committee of the House of Commons in 1868, appointed to consider the means of preventing fires, and, as it seems to us, would be most useful in the extended form above suggested. The present permissive system of local regulations appears wanting in uniformity and completeness to make it work satisfactorily.

ORGANS IN CHURCHES.

ST. MARY'S WOOLNOTH, CITY.

Sir,—I am much obliged to your correspondent, H. H. Statham, for his valuable remarks on the position of church organs, and the detestable practice of placing such noble instruments in any hole or corner, instead of making them an architectural feature in the church.

In reference to the removal of organs, and their rebuilding, especially in reference to St. Mary's Woolnoth, and St. Paul's Cathedral, or any instrument after being built some years, he states, that its removal from a gallery or loft to the floor is not necessarily prejudicial to its power and tone. I must strongly dissent from such a doctrine. In reference to the case in point, St. Paul's Cathedral, I think he is not well acquainted with the choir of that cathedral. He says in his able remarks, the deterioration of effect or sound was not the result of removal to a lower level, but of the confined situation. Such was not the fact. The confined situation was nowhere. Oceans of space existed in all reason in Wren's majestic interior. It was erected under one of the lofty arches on the north side of the choir, on the marble floor. Any one acquainted with the spot knows what extent of space was on each side of it—some 70 ft. one side, and 40 ft. the other. But it lacked one essential condition, namely, it had no space under it. It was built upon the marble floor. If a low position was not detrimental to its properties and tone, but rather the contrary, as, says your correspondent, it derives increased power from its proximity to the floor, how was it that neither music nor tone could be got out of it? It was taken down and again built in the same position, and the most experienced organist consulted; but all to no purpose. It was no more its former self, and a third time it was taken to pieces and rebuilt, where it now stands out in such bold relief.

I will state one more instance, as a case in point, to prove my assertion. The Temple Church some years ago, as your readers know, was restored. The organ, instead of its being built on the floor-level of the nave, Mr. Hopkins very wisely raised the floor-level of the organ-chamber some considerable number of feet above the level of the floor of the nave, and consequently there exists considerable space underneath the instrument.

Finally, I thank you, Sir, and your correspondent. You have before now done good service to the church and the profession by denouncing the use of those abominations, confined organ-chambers,—burying the noble instruments out of sight. In the case of St. Mary's Woolnoth no convenient space exists on the ground floor of the said church. It is a square building, with no projection. To place it so would be to take up half the accommodation of the floor-surface of the church. No better position can be found than the west gallery, which ought, with the north and south, to remain as Hawksmoor left them.

An Architect.

Banks.—A temporary bank is being fitted up at Ripley by Mr. Geo. R. Isborn, architect, for Messrs. Samuel Smith & Co., for whom he is also erecting banking premises at Derby and Nottingham.

FILTERS.

With reference to the Brighton Sanitary Exhibition, the Silicated Carbon Filter Co. claim that they exhibited by far the largest stand in the building, devoted exclusively to filters, and that their filters are constructed upon a principle totally different from all others exhibited, being the only kind adapted for the removal of lead from drinking-water. They add:—"As you have so frequently referred to the poisonous qualities of water impregnated with lead, we are sure you will give due credit to an apparatus which will remove it by the mere process of filtration."

CONCRETE ROOFS.

Sir,—I read the notes of your remarks at Brighton with much interest. I beg to call your attention to concrete roofs. Slates have risen these last four years to a high price, which has induced me to try some experiments how thin and light, combined with strength and soundness, it was possible to form Portland cement roofs. This I have done, to the great astonishment of the district surveyor of Camberwell. You, sir, will well remember the strong controversy I had with that gentleman some years ago. He is of very different opinion now. It has been most singular that I have built the greatest masterpieces of concrete in the kingdom in his district. I may mention that the roofs are groined. The cost is not more than one-half of a timber and slated roof, with the advantage of a lofty room and a fireproof roof, and I venture to say everlasting duration. J. Tall.

BUILDER'S CHARGE FOR TENDERING.

At the Lynn County Court, on the 20th inst. (before Mr. E. P. Price, Q.C., judge), Mr. Beloe appeared for the defendant in the case of John William Beeton, builder, Hunstanton *v.* The Rev. George Seaman, Primitive Methodist minister, Lynn, which was brought to recover the sum of 1*l.* 1*s.* "for money paid and for work done." Mr. Beeton stated that he was one of a number of other tradesmen who tendered for the erection of a schoolroom for the use of the Primitive Methodists. His was the lowest tender; but, instead of its being accepted, it was handed to the next highest tenderer, who was told that if he took the work at his (plaintiff's) figure he should have the contract.

His Honour.—Was it given out that the lowest tender was to be accepted?

Mr. Beloe.—Quite the contrary.

His Honour.—Then the plaintiff has no cause of action.

Mr. Beloe.—Not the least.

His Honour asked the plaintiff what he meant by stating on the summons that his claim was "for money paid and work done"?

Mr. Beeton replied that he had incurred expenses in coming sixteen miles to make the necessary inquiries before tendering. He made no complaint that his tender was not accepted; but seeing that the Methodists had profited to the extent of between 3*l.* and 4*l.* in consequence of the successful contractor having the benefit of looking over his tender, he thought it only fair that he should be paid the guinea he now claimed.

Mr. Beloe said that not only were the facts not as represented by the plaintiff, but they were the very reverse, and it was only by allowing for a quantity of old materials that the plaintiff's became the lowest tender.

His Honour gave judgment for the defendant, with costs.

LIVERPOOL GIRLS' COLLEGE.

AN HONOURABLE SECRETARY.

Sir,—A few months ago there was an advertisement for a competition for a new Girls' College at Liverpool.

I have been trying my very best from the first meeting to persuade the building committee to have a professional adviser, but they will neither consent to this nor to be bound by any of the rules for judgment of competitions agreed upon at the conference of architects held at the Royal Institute of Architects in London.

I have in consequence resigned my position as one of the secretaries, and shall be very much obliged if you will let me say, that I deeply regret having told some intending competitors who wrote to me that I fully expected that a professional assessor would be appointed. They will forgive me when I assure them that it has not been my fault. It is the first competition on which I have been engaged, and I shall be very glad if it is the last.

T. B. Banner.

Dungannon Waterworks and Drainage. A Committee was appointed by the Dungannon Board of Guardians in December last, to consider the proper steps to be taken (in accordance with the Public Health Act), with regard to the supply of water, and the drainage of the town of Dungannon, both of which are at present defective. The plans and specifications of Mr. J. L. D. Meares, C.E., for water supply, and of Mr. J. A. Dickinson, county surveyor, south division, county Tyrone, for drainage, were forwarded to the Local Government Board, who approved them, subject to some slight amendments. The water is to be brought from Altmore, near the village of Cappagh, about seven or eight miles from Dungannon.

SCHOOL BOARD SCHOOLS.

Brighton.—At the meeting of the Brighton School Board on the 12th inst., tenders for the erection of the Pelham-street schools were submitted. That of Mr. John Bruton, amounting to 6,320*l.*, was accepted.

Bromsgrove.—At the meeting of the Bromsgrove School Board on the 13th inst., the amended plans of Mr. F. J. Yates for schools at Dodford were presented, and Mr. J. Cotton attended with his plans for Lickey End Schools. After the plans were discussed, it was ordered that tracings of the same be made, to be sent in with the specifications, &c., to the Education Department.

Newtyle.—On the 18th inst. new Board schools were opened at Newtyle, N.B. The accommodation comprises an infants' school, 40 ft. by 18 ft., with bench and desk accommodation for eighty scholars, and a mixed schoolroom, 60 ft. by 24 ft., with desk accommodation for 120 scholars. In connexion with each department are class-rooms, lavatories, and cloak-rooms. The benches are of pitch-pine, supported on cast-iron standards. The ceilings are 15 ft. from the floor, and each room contains more than double the quantity of space required by the Government regulations. Mr. John Davidson, of Belmont Castle, was the architect.

Wick.—At a meeting of the parish School Board, Wick, held on the 15th inst., the tenders for the West Bank school and teacher's house were opened. There were four competing masons, five joiners, two plasterers, five painters, and two plumbers. The lowest offers were:—Mason's work, Messrs. John & James Brims, Wick, 1,117*l.*; joiner's work, Mr. William Miller, Pulteneytown, 633*l.*; plasterer's work, Messrs. W. & James Smith, Pulteneytown, 123*l.*; painter's work, Mr. Donald Bain, Pulteneytown, 27*l.* 10*s.*; and plumber's work, Mr. Benjamin Dunbar, Pulteneytown, 130*l.*

South Milford.—The South Milford School Board has appointed Mr. W. Bakewell, of Leeds, as its architect, and selected his design out of five which were submitted for new schools and master's house.

Peterhead.—At a meeting of the Peterhead Parish School Board, on the 13th inst., the following tenders for the erection of additional school buildings at Boddam, being the lowest, were accepted:—Mason's work, 875*l.*, Wm. M'Donald; carpenter's work, 590*l.*, Wm. Barclay; plasterer's work, 90*l.* 10*s.* 5*d.*, J. Gunn & Co.; slater's work, 117*l.* 7*s.*, Wm. Simpson; and plumber's work, 70*l.* 10*s.*, John Ferguson.

Books Received.

An Old Story: a Temperance Tale in Verse. By S. C. Hall, F.S.A. London: Virtue & Co., Ivy-lane.

Mr. Carter Hall is earnest in his efforts to lessen the evils of intemperance, and follows up "The Trial of Sir Jasper" with another book of wider scope and greater power. In this he has struck a good blow in a good fight. The poem is hung upon a well-known fable:—

> "The Devil bought a soul: so legends tell:
> The owner having nothing else to sell.
> The terms were easy; one of matters three
> He bound himself to do, and do it well.
> It was well done on his part: we shall see!"

The man is to do one of three things: to burn his father's house, or to kill his mother, or to get drunk. Of course he elects to get drunk, and, when he is so, he commits the other two sins. The author seeks to deal with every phase of the vice, and gives versified anecdotes in illustration; the main incident being a very common one in the history of temperance work,—a meeting of reclaimed drunkards, where each,—men and women,—relates his or her experience; contrasting their present with their past; their homes as they were and are.

To illustrate his verse he gives a most remarkable set of engravings from drawings by Miss Elizabeth Thompson, Birket Foster, James Sant, R.A., Marcus Stone, P. R. Morris, Erskine Nicol, A.R.A., N. Chevalier, L. J. Pott, Thomas Faed, R.A., E. Sherard Kennedy, Sir Noel Paton, R.S.A., Cave Thomas, M. Montbard, R. Lehmann, W. Maoduff, John Tenniel, W. C. T. Dobson, R.A., W. Hemsley, Fred Pasmore, G. A. Storey, Harrison Weir, George Cruikshank, Alma Tadema, Gustave Doré, and J. E. Millais, R.A. The drawings have been engraved by J. D. Cooper, Dalziel Brothers, Nicolls Brothers, Butterworth and Heath, W. Ballingall, J. C. Griffiths, C. M. Grey, J. D. Watson, and M. Laurie. The page headings, which are remarkably clever, are designed by Mr. W. J. Allen. An engraving faces every leaf, and every one of the fifty-one pages, of which the poem consists, contains a prose note explanatory of the working of the vice,—as described by judges, doctors, gaolers, coroners; in reports from workhouses, asylums, and so forth.

The story which these notes tell must be astounding to those who have not already probed the depth of the cancer-vice which afflicts the country, and should have much effect. We transplant one suggestive episode from the poem:—

> "An old man rose: I do not name his name,
> Nor do I tell my readers whence he came.
> This was his tale:—A painter drew a child,
> And called the picture 'Innocence': a grace
> It was: the soul was pure and undefiled:
> And, therefore, lovely were the form and face.
> At his dear mother's knee, in earliest youth,
> He knelt and pray'd, in simple love and truth.
>
> After long years had pass'd, the painter tried
> A different theme—to picture Guilt—and found
> His model in the jail: one deeply dyed
> In evil thoughts and acts: low on the ground
> He lay, a mortal image of Despair.
> Nor love, nor faith, nor hope, existed there.
> If you count life by years, yet in his prime:
> But he had lived a century of crime.
>
> At length some faded clue of memory brought
> A ray of past, yet not forgotten, thought;
> 'Surely,' he said, 'those features I must know:'
> Yes, 'twas the boy he painted long ago.
> From the close scrutiny he did not shrink:
> That man of sin—for whom a Saviour died:
> 'What brought you to this pass?' he ask'd, and sigh'd.
> The answer was one word—that word was 'Drink.'"

Many of the cuts are admirable, but none excel in frightful power the drawing of Sir Noel Paton to illustrate

> "For he's a jolly good fellow,
> Which nobody can deny!"

A half-draped figure of death, with cap and bells, a pipe in one hand, a glass in the other, dice and cards on the table, and the whole surrounded by the smoke and flames from a blazing punch-bowl.

The book can scarcely fail to produce a considerable effect, and we earnestly wish it a large circulation. Mr. Hall says at the close:—

> "This is the moral,—solemn, awful, true,—
> The drunkard never knows what he may do!"

We would have that last line, in clear, bold letters, hung up in every one of the new Board Schools, and in many places besides:—

> "The Drunkard never Knows what He may do!"

Having looked through "An Old Story" a second time, after writing the above, we record our deliberate opinion that it is the most powerful weapon that has yet been forged for the armoury of those who would fight against the dire evils of intemperance.

Miscellanea.

The Sheffield School Board and its Architect.—At a meeting of the Sheffield School Board, on the 14th inst., it was resolved that as fourteen out of the sixteen schools originally contemplated by the Board had been erected, a new agreement should be entered into with Mr. Innocent, the architect, by which he should receive 50*l.* per annum for his duties as architect to the Board, and a commission of 5 per cent. for certain other work. "Spectator in Hallamshire," writing in the *Sheffield Independent*, says: "I am not surprised that the School Board sought to amend its contract with Mr. Innocent, the architect, so far as his salary was concerned. When they engaged him at 100*l.* a year, there could have been little idea of the amount of commission that would fall into his hand for professional services in erecting the new schools. Most architects would have deemed the appointment a good one without any salary at all. But when the Board went further, and threw all future work open to competition, while, at the same time, the members expressed in the most ample terms their satisfaction with the manner in which Mr. Innocent had performed the duties of his office, they seemed to me to be inconsistent. Was it fair to a good servant to act thus? I suspect there was some design to secure a plum or two for other people."

Terra-Cotta.—An extensive deposit of terra-cotta clay, intersected with pipe clay, has just been discovered at Yatton, near Bristol. This discovery will probably lead to the establishment of a new industry in Somersetshire, similar to those which at present exist in Devonshire.

Watford Public Library.—The annual meeting of the Watford Public Library and School of Science and Art was held in the Agricultural Hall on the 13th inst. The chair was taken by Mr. W. H. Smith, M.P. The chairman, in the course of his address, said:—There were times when we were told that the English nation was a nation incapable of the art of design, almost incapable of originality; that when our manufacturers sought to produce something which should be attractive to the eye, which should please a cultivated taste, they were generally,—almost always,—compelled to go to France or Italy to find an artist who could give expression to those ideas and forms which would secure not only a ready sale for the articles of manufacture, but which please the eye of those who purchased them. We are all glad to know that that day is passing away, and that those who are instructed and those who teach in the art schools, the designers and the artists who are being turned out from those schools in different parts of the country, are rivalling in skill, taste, chasteness of design, and purity of expression, the most carefully-educated of the Continental designers and artists. Those ladies and gentlemen who have for themselves acquired and perfected a new industry, a new capacity for earning money, have a new claim upon the respect and confidence of their fellow-creatures. It is no light matter. I conceive, and venture to impress upon you, that a man is not doing his duty if he does not make the greatest use of those powers which nature and God have given to him. A considerable number of prizes were distributed. Dr. Puckett is the head master of the school of art.

The Widening of Chancery-lane.—The works in connexion with the widening of the Holborn end of Chancery-lane have been commenced. The materials of three houses in Chancery-lane, and six other houses and shops in Holborn, have been sold, by order of the trustees of St. Bartholomew's Hospital, to whom the property belongs. We mentioned some time ago the price obtained for the land. The ground upon which the three houses in Chancery-lane stands, extending from the boundary of the Chancery Registry offices to the corner of Holborn, about 18 ft. in depth, will be thrown into the street, thus nearly doubling the width of the roadway at this point. The line of frontage of the widened thoroughfare will be carried in a westerly direction from the Chancery Registry buildings to its junction with Holborn, and negotiations are in progress for setting back the dead wall immediately north of these buildings.

New Post Offices for Warrington and Shrewsbury.—Her Majesty's Office of Works has invited tenders from Messrs. Gibson & Sons, and other local builders, for the erection of the post-office at Warrington. The old Butter-market on Pride-hill, Shrewsbury, has, during the past few weeks, been in course of demolition, the site having been purchased some time ago by the Government for the erection of a new post-office; and the execution of the work has been entrusted to Messrs. Bull & Son, of Southampton, who are at present carrying out several other contracts with the Government, including that for the erection of the Law Courts. Mr. James Williams, of Her Majesty's Office of Works, is the architect of both offices.

The Drainage of Maidstone.—Three weeks ago (p. 917) we announced that the Maidstone Local Board had accepted the plans of Mr. Lewis Angell for the drainage of the town, the estimated cost being 30,000*l*. At a meeting of the Board on the 20th inst. a letter was read from Mr. Buckham, formerly borough surveyor, claiming the invention of the drainage plans accepted from Mr. Angell, and asking for some compensation. Mr. Buckham pointed out that in 1867 he submitted a scheme to the Board, the originality of which consisted in the proposal to construct an intercepting sewer, and conduct the sewage below Allington Lock. With very slight modifications, this plan had been adopted by Mr. Angell. The letter was referred to the Drainage Committee.

Death of Mr. James Danby.—Mr. James Francis Danby died of apoplexy on the 21st inst. He was the son of the late Francis Danby, A.R.A., and was born in Bristol in 1816. He was a constant exhibitor at the Academy, and at the Society of British Artists, of which latter body he had recently been elected a member.

Crown Lands.—The report of the Commissioners of her Majesty's Woods, Forests, and Land Revenues tells us that the total amount of revenue for the year ending March, 1875, was 327,278*l*., viz.:—

Farms and lands let for farming purposes (70,092 acres)	£114,699	0	6
500 houses and other buildings	55,255	12	1
Land let for building purposes, including ground-rents of 4,574 houses, built by lessees	128,442	16	8
Royalties of mines, minerals, &c.	12,849	9	3
Tolls	10,317	1	6
Manors (quit-rents, &c.)	3,081	2	10
Plantations, &c.	2,634	5	7

The above is exclusive of 14,000 acres, comprising the Windsor Castle domain.

Water Rates in the Metropolis.—We recently alluded to the somewhat "sharp practice" of some, if not all, of the metropolitan water companies, in taking advantage of a manifest oversight in recent legislation. This oversight is likely to be remedied before long, for the Metropolitan Board of Works has taken up the question. At a recent meeting of that body, it was resolved, on the motion of Mr. Roche, "That it be referred to the Works and General Purposes Committee to consider and report upon the advisability of introducing into Parliament a Bill for amending the Acts relating to the supply of water to the metropolis." The Corporation of London will co-operate with the Metropolitan Board of Works in this matter.

The Slate Trade of North Wales.—The slate trade of North Wales is at the present time very flourishing. The demand appears to be greatly in excess of the supply, and notwithstanding the late rise in price, orders are very pressing. Notice has been given by all the quarry proprietors, both in Merionethshire and Carnarvonshire, of a further rise for November 1 of about 10 per cent., making a total rise within the last three years of about 33⅓ per cent. on some sizes, and 50 per cent. on others. Best slates, 20 by 10, which were formerly quoted at 135*s*., are now 180*s*., and 16 by 8, and 14 by 10, which were formerly 63*s*., are now in great demand at the advanced tariff price of 100*s*.

"Herne Bay Brick Fields Company."—This company, advertised in our last issue, has been formed for the purpose of acquiring and working a brickfield at Herne Bay, Kent, consisting of about sixty-three acres. The lease is for the term of twenty-one years, at a rental and royalty, and power is given to extend the term to ninety-nine years. Herne Bay is favourably situated for any demand from several important towns, being only seventeen miles from Margate, with its rising neighbour Westgate-on-Sea, twenty-two miles from Ramsgate, and ten miles from Faversham, whilst London is only fifty-five miles distant.

A Disputed Contract.—At the meeting of the St. Pancras Board of Guardians on the 21st inst., Mr. Bridgman, the architect, and Mr. Aitchison, the contractor for the new buildings, attended, and it appeared from the statements made by them that the contractor had made a mistake in his tender of 200*l*., which the architect declined to sanction, and the contractor refused to give up possession of the building until the Board consented to pay the 200*l*., and alleged that the keys of the building and possession were given up without his sanction. The matter consequently remains in abeyance.

Connell's Sure Water-Waste Preventer.—In the abstract we have no great love for water-waste preventers; but, under many circumstances now they must be used, and the arrangement patented by Mr. Connell seems a very ingenious and effective one. The principle of the article is explained in our advertising columns. It is simple in construction and is adjusted to run about two gallons, which quantity it delivers in two distinct operations each time the closet is used, the first when the closet-handle is pulled up,—this flushes and cleanses the pan; the second, when the handle is put down,—this flushes and seals the pan.

A Marine Residence in Ireland.—Classybawn House, Mullaghmore, within fifteen miles of Sligo, has just been completed, as a marine residence for the Right Hon. W. F. Cowper-Temple. The building, which is in the Domestic Gothic style, occupies a picturesque site. The masonry throughout is pitch-faced ashlar, the local stone being used, the dressings being from the Mountcharles quarries. Mr. J. R. Carroll, of Dublin, is the architect; Mr. Hollwey acted as clerk of the works; and Mr. Morris was the builder.

"Back-Passages" at Middlesbrough.—The Middlesbrough Town Council seems to have been for some time past contending with builders and property-owners as to the width to be observed for the back-passages or narrow lanes in the rear of the houses. The Town Council insists on these passages being 12 ft. wide; the building and land jobbing interests are agitating for 9 ft., and are doing their utmost to elevate the controversy into the region of an election test on the 1st of November. A local firm has sent in plans of houses which show neither back-passages nor back-doors. It is stated that there is nothing in the bye-laws to enforce a back-passage.

Birmingham Improvements.—The Birmingham Town Council have adopted the concluding portion of the great scheme of municipal extension by the approval of the report of the Water Committee, setting forth the terms arranged with the local Waterworks Company for the transfer of their business to the Corporation. The terms of purchase include a perpetual annuity of 541,491*l*., a sum of about 3,000*l*. for winding-up purposes, and such a sum in cash as shall be equal to the dividend payable by the company for the current half-year. These payments are secured upon the waterworks and the borough rates.

Proposed Baths for Lowestoft.—On the 11th inst. a meeting was held at the Royal Hotel, Lowestoft, to take into consideration a project for the establishment of public baths, reading, billiard, and assembly rooms. Mr. J. L. Clemence produced the plans of the contemplated building. The site is proposed to be the corner piece of ground between the bridge and pier-gate. A skating rink is included in the arrangements. The cost of the works will be about 10,000*l*., and nearly one-fifth of the capital was subscribed in the room.

Death of Sir Charles Wheatstone.—The death is announced of Sir Charles Wheatstone, whose name has been for half a century before the world as the discoverer of that portion of electric science which, by the practical aid of Sir William Fothergill Cooke, resulted in the invention of the electric telegraph, with all its manifold applications to the purposes of daily life. He died at Paris on the 19th inst., at the age of seventy-three. He was born in Gloucester in the year 1802, and educated for the trade of a maker of musical instruments.

St. Alban's School of Art.—The *conversazioni* given by the committee of the St. Alban's School of Science and Art, have met with a very considerable amount of success. In connexion with the *conversazioni* is a loan exhibition of works of art, &c., which forms the chief attraction, and it even exceeds all the anticipations that had been entertained for the success of the efforts of the committee in this direction. Hope is expressed that the time is coming when this town, like Watford, will have a public building and public library of its own.

The Herts County Surveyorship.—At the Herts Quarter Sessions, on the 21st inst., the County Finance Committee reported that they had resolved that, until the appointment of a county surveyor in the room of the late Mr. Thos. Smith, the duties of the office should continue to be performed by his son, Mr. Urban A. Smith, of Hertford, on whom those duties had for some long time past devolved. Reference was made to the able and efficient manner in which the late Mr. T. Smith had for a period of forty years fulfilled the duties of county surveyor.

Memorial to Bishop Terrott.—A mural tablet has just been erected in St. Paul's Episcopal Church, Edinburgh, in memory of the late Bishop Terrott. The tablet, which stands about 12 ft. in height, was designed by Mr. David Bryce, R.S.A., in a style harmonising with the Gothic architecture of the church; and has been executed by Mr. John Rhind, sculptor, in Sicilian marble. Resting on a corbelled base, it is flanked with shafts and surmounted with Gothic arching, which, as well as the base, is enriched with ornamental detail.

New Lunatic Asylum for Surrey.—The Asylums at Wandsworth and Brookwood being found insufficient to accommodate the continually increasing number of lunatics in the county of Surrey, it was resolved, at the Surrey Quarter Sessions last week, to build a third asylum, and a committee was empowered to purchase a site at a cost not exceeding 12,000*l*.

The Strike of Plasterers at Dundee.—Three weeks ago the Dundee plasterers struck work in consequence of the masters refusing to abide by the rule of the society which enacts that only two apprentices and one message-boy shall be allowed to each shop. On the 23rd inst. the employers intimated their intention to stand by the society's rules. The men said the strike had cost the society 120*l.*, and that employment could not be resumed unless part of that outlay was refunded. The employers have agreed to give 55*l.*

Clock and Watch Makers' Asylum, Southgate.—On the 23rd inst., two memorial houses,—the "Workmen's Memorial House," and the "F. A. Taylor Memorial House," which have been added to the Clock and Watch Makers' Asylum, near Southgate, were opened. The "workmen's house" was built by the aid of shilling subscriptions from the journeymen watch and clock makers of Clerkenwell and elsewhere. Mr. Henry Carpenter, of Moorgate-street, was the architect, and Mr. Ely, of Colney Hatch, the builder.

Southwark Bridge.—At the meeting of the Court of Common Council, on the 21st inst., it was resolved, on the motion of Mr. G. J. Cockerell,—"That as the relief to the increasing traffic between the north and the south of the river Thames contemplated by the Corporation when it purchased and freed from toll Southwark Bridge has failed to be accomplished, it be referred to the Bridge House Estates Committee to obtain designs and estimates for improving the gradients of the bridge, and to report to the court forthwith."

Proposed Restoration of a Ruined Church.—It is proposed to restore the ruins of Steetly Church, near Worksop, in order to supply the church necessities of the neighbourhood. A service in furtherance of the proposal was held in the midst of the ruins on the 17th inst., and the trustees of the late Duke of Newcastle, in whom the property is vested, have intimated their approval, and promised their aid.

New Street in Shoreditch.—The Metropolitan Board of Works has agreed to contribute one-half the net cost (55,800*l.*) of the construction of a new street from Worship-street, Shoreditch, to Sun-street, Bishopsgate. This new street will greatly obviate the inconvenience caused by the permanent closing of Sun-street by the erection of the new terminus of the Great Eastern Railway.

A Proposed Recreation Ground for Chatham.—At a meeting of the Chatham Local Board of Health, on the 22nd inst., it was resolved to accept the offer of Colonel Stokes, C.B., Commanding Royal Engineer, to let a quantity of land, near the Martello Tower, Hamond-hill, for the purpose of a public recreation ground. The Local Board is to pay a rent of 5*l.* per acre per annum to the War Office.

Proposed Baths for the South Side of Glasgow.—Last week, a meeting of gentlemen interested in the formation of a company for the purpose of erecting swimming, Turkish, and other baths on the south side of Glasgow, was held in the Religious Institution Rooms. Councillor Wm. Wilson presided, and the meeting was well attended. Before the meeting separated no fewer than 400 shares were taken up by thirty-three subscribers.

Death of the Clerk of Works at Chester Cathedral.—The *Chester Chronicle* announces the death of Mr. James Frater, the clerk of the works at Chester Cathedral. For the past eighteen months he had been in bad health, and he died last week of congestion of the lungs. He had acted as clerk of the works under the direction of Sir Gilbert Scott for sixteen or seventeen years.

Trade Census in Germany.—The German Government has ordered a general census of trades, which is to show how many persons in every parish follow each several calling. The results will be compiled in the shape of tables for the various States and the entire empire. Preparations are now in progress for the census, which is to be taken on December 1st.

Proposed New Municipal Buildings for Nottingham.—The Nottingham Town Council has decided to advertise for plans and designs of proposed new town-hall, free library, sessions court, police court, judges' rooms, &c. The site selected is at the corner of Broad-street and St. John's-street.

Charing-cross Hotel.—It is rumoured that the already gigantic Charing-cross Hotel is to be extended, if Parliamentary powers can be obtained next session. The company is prepared to spend 20,000*l.* on the building of additional premises, and the services of a surveyor have already been engaged in "looking over" the property adjoining the hotel in Villiers-street.

Knightsbridge Barracks.—An evening paper has the following:—The question of removing, or rather rebuilding, Knightsbridge Barracks has been settled apparently. We hear that on Monday a considerable part of the barracks began to fall in. Some of the troops had immediately to be removed.

Proposed New Recreation Ground for Southampton.—The Southampton Town Council have decided to open negotiations with the authorities of Queen's College, Oxford, for the purchase of Porter's Meadow, near the Platform, in order to lay it out as a place for public recreation.

The Disney Professorship of Archæology, Cambridge.—The Rev. Churchill Babington, M.A., of St. John's College, Cambridge, was, on the 22nd inst., re-elected for five years to the Disney Professorship of Archæology.

Sudden Death of a Retired Builder.—Mr. William Parmenter, who for many years carried on business at Bocking, as a builder, died very suddenly on the 16th inst., in his seventy-fourth year.

Accidents at the New Law Courts.—Four men are now lying in King's College Hospital suffering from injuries sustained at the works of the New Law Courts, near Temple Bar.

TENDERS

For additions, &c., St. Mary's Priory, Stamford-hill, Mr. C. G. Wray, architect. Quantities supplied by Messrs. Linsdell & Giffard:—

Stamp & Bowtle, accepted.

For alterations and additions to St. Ann's Church, South Lambeth-road. Mr. E. Parkinson, architect. Mr. F. T. Mullett, surveyor:—

Jackson & Shaw	£3,913 0 0
Adamson & Son	3,590 0 0
Small	3,559 0 0
Morter	3,520 0 0
Fish	3,419 0 0
Hill, Higgs, & Hill	3,400 0 0
Dearde	3,354 0 0

For the erection of Turkish, plunge, and other baths, at Barrow-in-Furness, for Mr. Daniel Routledge. Mr. Howard Evans, architect. Quantities supplied:—

Contract No. 1.

Ward	£1,320 0 0
Saddler Wood, & Andrews	1,289 10 0
Kelsall	1,240 0 0
Henderson	1,185 0 0
Gilchrist	1,153 0 0
Gradwell (accepted)	1,150 10 0

For the erection of saw-mills, stables, &c., for Messrs. Eldridge & Youngman, at Glengall-road, Old Kent-road. Mr. Charles Bell, architect:—

Whecker	£1,718 18 0
W. & F. Croaker	1,679 0 0
Staines	1,674 0 0
Baguley	1,648 0 0
Nightingale	1,643 0 0
Greenwood & Son	1,630 0 0
Shepherd	1,593 0 0
Stephenson	1,515 0 0
Ball	1,506 0 0
Tarrant & Son	1,485 0 0

For the erection of new dining-halls, kitchen, bakery, &c., and alterations to laundry, including machinery and cooking apparatus, &c., at St. Pancras workhouse, for the Guardians of the Poor of St. Pancras. Mr. H. H. Bridgman, architect. Quantities supplied by Mr. W. Barnett and Messrs. Brown, Baker, & Furnis:—

Staines & Son	£13,580 0 0
Tarrant	13,200 0 0
Toms	12,975 0 0
Wilson, Brothers	12,933 0 0
Niblett	12,869 0 0
Oliver	12,760 0 0
Merritt & Ashby	12,590 0 0
Crockett	12,440 0 0
Elkington	12,440 0 0
Aitchison & Walker	12,393 0 0
Hunt	12,365 0 0
Moreland & Nixon	11,870 0 0
Bracher & Son	11,750 0 0
Manley & Rogers (accepted)	11,342 0 0

For Hebrew Library in St. James's-place, Aldgate. Messrs. N. S. Joseph & Pearson, architects. Quantities by Mr. Green:—

Rivett	£2,334 0 0
Killby	2,308 0 0
Bangs & Co.	2,284 0 0
Newman & Mann	2,243 0 0
Merritt & Ashby	2,240 0 0
Elkington	2,234 0 0
Lidstone	2,220 0 0
Brass	2,185 0 0
Langmead & Way	2,100 0 0
Browne & Robinson	2,090 0 0
Smith	1,977 0 0

For Portsmouth Lunatic Asylum. Mr. George Rake, architect. Quantities supplied by Messrs. H. P. Foster & C. M. Houghton:—

Langdon*	£101,200 0 0
Martin	87,600 0 0
Colls & Son	84,345 0 0
Kirk & Randall	81,479 0 0
Conder	80,550 0 0
Langley	80,069 0 0
Downs	79,500 0 0
Roberts	76,950 0 0
Sibley	76,779 0 0
Burbidge	76,271 0 0
Bramble, Brothers	76,250 0 0
Evans	76,100 0 0
Light	75,990 0 0
Ward	75,130 0 0
Hayter	75,000 0 0
Hill, Higgs, & Hill	74,780 0 0
Barns	71,900 0 0
Cooper	70,989 0 0
Quick (accepted)	63,898 0 0

* Error in casting.

For a shooting box, at Eastley Wootton, New Forest, Hants, for Capt. A. P. Beaumont. Mr. J. Turk Lacey, architect. Quantities by Mr. C. R. Griffiths:—

Dashwood (accepted)	£3,443 0 0

For dwelling-house, offices, and stabling, at High-street, Sutton, for Mr. A. Adds. Mr. J. Turk Lacey, architect. Quantities by Mr. C. R. Griffiths:—

Aviss & Co.	£2,060 0 0
Messom	1,948 0 0
Sparrow	1,900 0 0
Cuff	1,860 0 0
Keal	1,740 0 0
Potter	1,540 0 0

For stabling and garden-walling, at Eastley Wootton, New Forest, Hants, for Capt. A. P. Beaumont. Mr. J. Turk Lacey, architect:—

Dashwood (accepted)	£1,104 8 10

For the erection of St. Giles's new Infants' School, Waterloo-street, Camberwell. Mr. J. Turk Lacey, architect. Quantities by Mr. C. R. Griffiths:—

Revised Tenders.

Minard	£1,714 0 0
Maxwell	1,667 0 0
Goad	1,620 0 0
Thompson	1,570 0 0
Oliver	1,500 0 0
Hayworth	1,477 0 0
Pritchard (accepted)	1,398 0 0

For reconstructing 3 and 4, Agnes Villas, Bayswater-road. Messrs. Joseph & Pearson, architects:—

Hill, Higgs, & Hill	£11,685 0 0
Killby	11,487 0 0
Scrivener & White	11,368 0 0
Nightingale	11,223 0 0
Newman & Mann	11,185 0 0
Downs & Co.	10,812 0 0
Browne & Robinson	10,781 0 0
Coleman	9,792 5 0
Elkington	9,774 0 0

For constructing about 550 feet of 12-in. pipe sewer, &c., Dorville-gardens, Hammersmith, for Mr. F. Biers, jun. Mr. A. C. Bean, engineer. Quantities by Mr. Alfred J. Bean:—

Thompson & Son	£320 0 0
Keeble (accepted)	295 0 0

For the erection of a school for 1,104 children, on the site in Wolverley-street, Bethnal-green, for the School Board for London. Mr. E. R. Robson, architect. Quantities by Mr. W. H. Barber:—

Williams & Son	£11,637 0 0
Dove, Brothers	11,603 0 0
Scrivener & White	11,565 0 0
Lawrance	11,470 0 0
Stimpson & Co.	11,260 0 0
Hobson	11,226 0 0
Boyce	11,194 0 0
Ennor	11,094 0 0
Pritchard	11,009 0 0
Brass	11,033 0 0
Sheffield (accepted)	10,879 0 0

For the erection of middle-class dwellings on the Crystal Palace-road estate, Peckham-rye, for the Temperance Artisans', Labourers', and General Dwellings Association, Limited:—

Newton (accepted)	£3,700 0 0

For finishings to one pair of semi-detached residences on the Mount Pleasant estate, Hastings. Messrs. Jeffrey & Skiller, architects:—

Eldridge	£1,555 10 0
Vidler	1,365 10 0
Russell	1,300 0 0
Harman	1,289 0 0
Womersley	1,281 11 6
Champion	1,288 14 0
Nowers	995 0 0

For alterations and additions to Roseau House, Addison-road, Kensington, for Mr. John Lound. Mr. John Calder, architect. Quantities supplied by Mr. R. O. Harris:—

Merritt & Ashby	£3,145 0 0
Ashwell	3,105 0 0
Longmire & Burge	3,078 0 0
Curtis	3,000 0 0
Lascelles	2,990 0 0
Falkener	2,975 0 0
Colls & Son	2,965 0 0

For building the Rotherhithe Fire Brigade Station, for the Metropolitan Board of Works. Mr. George Vulliamy, architect:—

Shurmur (accepted)	£3,987 0 0

For alterations at The Crown, Hackney. Mr. E. Brown, architect:—

Stamp & Bowtle, accepted.

For house on Green Hill estate, Hampstead. Messrs. Spalding & Knight, architects. Quantities by Mr. G. Fleetwood:—

Dove, Brothers	£2,550	0	0
Downs & Co.	2,507	0	0
Burford	2,434	0	0
Roberts	2,415	0	0
Carter & Son	2,398	0	0
Lawrence	2,393	0	0
Bywaters	2,379	0	0
Boyce	2,344	0	0
Sharpington & Cole	2,297	0	0
Temple & Foster (accepted)	2,158	0	0

For the erection of a school, Rushmore-road, Clapton-park, for the School Board for London. Mr. E. R. Robson, architect. Quantities by Messrs. Northeroft, Son, & Neighbour:—

Coleman	£8,575	0	0
Williams & Son	8,570	0	0
Oliver	8,499	0	0
Boyce	8,402	0	0
Grover	8,394	0	0
Newman & Mann	8,366	0	0
Ennor	8,348	0	0
Hobson	8,177	0	0
Wall, Brothers	7,989	0	0
Nightingale	7,983	0	0

For the erection of a school, Wellington-street, Hoxton, for the School Board for London. Mr. E. R. Robson, architect. Quantities by Mr. Nicholls:—

Boyce	£9,495	0	0
Williams & Son	9,495	0	0
Coleman	9,442	0	0
Newman & Mann	9,397	0	0
Hobson	9,359	0	0
Grover	9,267	0	0
Oliver	9,264	0	9
Ennor	9,127	0	0
Pritchard	9,045	0	0
Nightingale	8,873	0	0
Wall, Brothers	8,830	0	0

For first house at Roupell Park, for Mr. T. Kemp Welch. Mr. E. C. Robins, architect. Quantities by Mr. Austin:—

Salmon	£3,395	0	0
Taylor	3,250	0	0
Adamson	3,016	0	0
McLachlan	3,008	0	0
Lathey, Brothers	2,995	0	0
Pritchard	2,954	0	0
Kandler	2,950	0	0
Newman & Mann	2,928	0	0
Hill, Higgs, & Hill	2,916	0	0
Sharpington & Cole	2,766	0	0
Hobson	2,745	0	0
Garrett	2,708	0	0

For the erection of a building, No. 56, Old Broad-street, E.C, for Messrs. Macdonald & Hyde. Mr. E. A. Gruning, architect. Quantities supplied by Messrs. E. Biven & T. Nixon:—

Laird	£4,380	0	0
Lidstone & Son	4,228	0	0
Oliver	4,200	0	0
Ennor	4,111	0	0
Shurmur	3,780	0	0
Colls & Sons	3,730	0	0
Merritt & Ashby	3,597	0	0
Newman & Mann (accepted)	3,565	0	0

For finishing warehouses at London-wall, for Mr. Holland. Messrs. Curtis & Sons, architects:—

Ashby, Brothers	£5,994	0	0
Rivett	5,969	0	0
Tongue	5,930	0	0
Bracher	5,919	0	0
Sharpington & Cole	5,897	0	0
Foster	5,877	0	0
Greenwood	5,875	0	0
Cooke & Green	5,746	0	0
Browh	5,650	0	0
Carter	5,640	0	0
Bayes & Ramage	5,490	0	0
Merritt & Ashby	5,490	0	0
Crabb	5,290	0	0
Newman & Mann	5,282	0	0

For rebuilding the Mother Redcap, Camden-town, for Mr. J. O. Harris. Mr. H. H. Bridgman, architect. Quantities supplied by Mr. Walter Barnett and Mr. F. Thomson:—

Willson, Brothers	£6,165	0	0
Manley & Rogers	5,694	0	0
Kelly, Brothers	5,730	0	0
Hunt	5,674	0	0
Toms	5,665	0	0
Elkington	5,405	0	0
Crockett	5,353	0	0
Bracher & Son	5,397	0	0
Tarrant	5,292	0	0
Scrivener & White (accepted)	5,179	0	0
Aitchison & Walker	5,093	0	0

For offices, Deptford-green, for Messrs. Humphrys, Tennant, & Co. Mr. John Whichcord, architect. Quantities by Mr. W. Barrett:—

Macey	£1,530	0	0
Newman & Mann	1,516	0	0
Morter	1,431	0	0
Williams	1,377	0	0
Slade	1,300	0	0

For stabling, Redeross-square, Borough. Mr. E. B. Florence, architect. Quantities by Messrs. Batterbury & Huxley:—

Newman & Mann	£788	0	0
Downs	748	0	0
Cullum	742	0	0
Joslyn	738	0	0
Taylor	659	0	0

For additions to the Royal Normal College and Academy of Music for the Blind, at Upper Norwood. Mr. John Norton, architect. Quantities by Mr. S. J. Thacker:—

Braid, Jopling, & Co.	£7,011	0	0
Newman & Mann	6,961	0	0
Lawrence	6,812	0	0
Holland & Hannen	6,639	0	0

For alterations, additions, and repairs, to Baptist Chapel, Tottenham. Messrs. Charles G. Searle & Sons, architects. Quantities prepared by Mr. C. H. Searle:—

Newman & Mann	£1,609	0	0
Dove, Brothers	1,495	0	0
Linsell & Sons	1,400	0	0
Roberts	1,245	0	0

For alterations and additions to the Haberdashers' Arms, 114, Pitfield-street, Hoxton, for Mr. Berry. Messrs. Bird & Walters, architects. Quantities supplied:—

Ebbs & Son	£1,294	0	0
Nightingale	1,293	0	0
Newman & Mann	1,270	0	0
Lawrence	1,249	0	0
Williams	1,232	0	0
Anley	1,185	0	0
Ennor	1,092	0	0

TO CORRESPONDENTS.

"Light in London" (although advertised, we are compelled to postpone this article).—T. M.—H. G.—A. M.—J. P. R. T.—A. & C. H.—T. K. G.—J. T. L.—S. & B.—J. & P.—G. R. I.—F. A. B.—M. A.—J. C. K.—E. L. B.—H. H.—W. W. Y.—T. M. R.—J. F.—S. & K.—H. R.—E. P.—J. T. S.—W. S.—E. E.—C.—W. C.—J. & S.—H. P. F.—P. S. (apply to an architect).—B. M. (apply to an architect; it is not our province to furnish designs for a reader's special purpose).—B. B. (under our mark).—W. G. B. (next week).

We are compelled to decline pointing out books and giving addresses.

All statements of facts, list of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

Note.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

CHARGES FOR "WANTED" ADVERTISEMENTS.

	Situations Wanted.	Situation s Vacant.
Six lines (about fifty words) or under ..	2s. 6d.	4s. 6d.
Each additional line (about ten words)..	0s. 6d.	0s. 6d.

TERMS OF SUBSCRIPTION.

"THE BUILDER" is supplied, *direct* from the Office, to residents in any part of the United Kingdom at the rate of 19s. per annum, *Payable in advance.*

Halfpenny stamps accepted for amounts under 5s. Any larger sum should be remitted by Money Order, payable at the Post Office, King-street, Covent-garden, W.C. to DOUGLAS FOURDRINIER.

Advertisements cannot be received for the current week's issue later than **THREE** o'clock p.m. *on THURSDAY.*

The Publisher cannot be responsible for Testimonials *left at the Office in reply to Advertisements, and strongly recommends that* Copies only *should be sent.*

☞ *NOTICE.—All communications respecting Advertisements, Subscriptions, &c., should be addressed to "The Publisher of the Builder," No. 46, Catherine-street, Covent Garden. All other Communications should be addressed to the "Editor," and* NOT *to the "Publisher."*

Bath Stone of best quality.
RANDELL, SAUNDERS, & CO. (Limited), Quarrymen and Stone Merchants.
List of Prices at the Quarries and Depôts; also cost of transit to any part of the Kingdom, on application to
Bath Stone Office, Corsham, Wilts. [Advt.]

Patent Selenitic Cement, with double the usual sand, is much stronger than ordinary mortar. Plastering finished in much less time at less cost. Excellent substitute for Portland cement for Concrete at less than half its price.—21½, Millbank-street, S.W. [Advt.]

Asphalte.
Seyssel, Patent Metallic Lava and White Asphaltes.
M. STODART & CO.
Office:
No. 90, Cannon-street, E.C. [Advt.]

Whitland Abbey Green Slates.—These Quarries are now fully opened out, and are producing Slates in all sizes, and in any quantity: sound, and of choice green tint.—For samples and further particulars, apply to the MANAGER, at the Quarries, Narberth-road, R.S.O. [Advt.]

Notice to Inventors.
HERBERT & CO. Patent Office, 67, Strand, London. British and Foreign Patents obtained at Fixed and Moderate Charges. Searches made. Sales and Licences negotiated. Handbook and information gratis.—[Advt.]

MICHELMORE & REAP,
Manufacturers of
CHARLES COLLINGE'S PATENT
COLLINGE'S PATENT HINGES, LEVER, SCREW, & BARREL BOLTS,
and IMPROVED GATE FITTINGS of every Description.
Discount to Builders. Illustrated Sheet on application.
36A, BOROUGH ROAD, LONDON, S.E.

PERFECTION in BOOKKEEPING.—Builders and Others desiring a really good system, can have a SET of MODELS for BUILDERS' BOOKS, by DOUBLE ENTRY, to which was awarded the prize offered in "The Builder," No. 1,180, and which has been adopted by many large firms. Also a modified arrangement by Single Entry, suitable for small builders.—Address, E. A. JONES, 2, Freemason's-terrace, Ilford-road, Upton, E.

ORNAMENTAL WRITING for PAINTERS and WRITERS.
H. D. SMITH'S MANUAL of PLAIN and ORNAMENTAL ALPHABETS, Ancient and Modern, for the Use of Engravers and Ornamental Writers, sent post-free on receipt of 1s. 6d. in stamps.
T. J. ALLMAN, 463, Oxford-street, London.

FRASER'S MAGAZINE, No. LXXI.—NOVEMBER.—CONTENTS:—
A Ride through Bosnia. (With a Map.)
The History of Twins.
The Ventilation of Hospitals.
De La Grange's Diary.
Mohammedanism and the Negro Race.—By a Negro.
German Home Life.—VII. Women.
Alfonso the Wise.
The Survival of Paganism.
An Autumn in Western France.
The Papal Drama.
Notes on the Navy.
London: LONGMANS & CO.

New Edition, revised and enlarged, and Complete in One Volume royal 8vo. with 5 Plates and 124 Woodcut Illustrations, price 30s. cloth.
THE THEORY of STRAINS in GIRDERS and similar Structures, with Observations on the Application of Theory to Practice, and Tables of the Strength and other Properties of Materials.
By BINDON B. STONEY, M.A. M. Inst. C.E. Engineer to the Dublin Port and Docks Board.
London: LONGMANS & CO.

Just ready, 12mo. 416 pp. cloth boards, price 6s. (postage 5d.).
HOUSE PAINTING, GRAINING, MARBLING, and SIGN WRITING (a PRACTICAL MANUAL of). With Nine Plates of Woods and Marbles, printed in Colours, and nearly 150 Wood Engravings.
By ELLIS A. DAVIDSON.
London: LOCKWOOD & CO. 7, Stationers' Hall-court, E.C.

Just published, royal 4to. sewed, price 18s.
THE ANCIENT DOMESTIC EDIFICES of BRUGES. Specimens from Drawings taken on the spot.
By CHARLES VERSCHELDE, Architect.
Forty Lithographic Plates, with Descriptive Text.
London: B. T. BATSFORD, Architectural Bookseller and Publisher, 52, High Holborn, W.C.

This day is published,
HANDY-BOOK of ORNAMENTAL CONIFERS, and of RHODODENDRONS and OTHER AMERICAN FLOWERING SHRUBS, suitable for the climate and soils of Britain; with descriptions of the best kinds, and containing useful hints for their successful cultivation.
By HUGH FRASER, Fellow of the Botanical Society of Edinburgh.
Crown 8vo. 6s.
Published by WILLIAM BLACKWOOD & SONS, Edinburgh and London.

Demy 8vo. cloth, 2s. 6d.
THE ORDNANCE SURVEY of the KINGDOM: its Objects, Mode of Execution, History, and Present Condition.
By Captain H. S. PALMER, R.E.
With a Catalogue of the Maps, Plans, and other Publications of the Ordnance Survey of Great Britain and Ireland, and of the Models of the Ordnance Surveys of Jerusalem and Sinai, published under the Superintendence of Major-General Sir HENRY JAMES, R.E. F.R.S.
Five Coloured Index Maps.
London: EDWARD STANFORD, 55, Charing-cross, S.W.

SORT YOUR PAPERS INTO
STONE'S PATENT BOXES.
Sold by all Stationers.
Full particulars, post-free, of HENRY STONE, Patentee and Manufacturer, BANBURY.

TO ENGINEERS and SURVEYORS.—PRIVATE BILLS, New Standing Orders for the ensuing Session, Levelling Books, Tracing Paper, Drawing Paper, and every requisite for the use of Engineers, &c. engaged in the preparation of Plans for deposit. Plans, &c. Lithographed with the greatest expedition.—WATERLOW & SONS, 49, Parliament-street, and 66, London Wall, London.

STANDIDGE & CO. 36, Old Jewry, E.C. and Moorfields, and Westminster, are prepared to EXECUTE any amount of LITHOGRAPHY for PARLIAMENTARY DEPOSIT on the shortest notice and most reasonable terms.

NO GAS IN DAYTIME.

Use Chappuis' Patent Daylight Reflectors.

MANUFACTORY: 69, FLEET STREET.